JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. LXXIX., No. 2038.—TUESDAY, JUNE 3, 1902.

EDITORIAL NOTES.

Peace—and After.

THE welcome news of the conclusion of peace in South Africa cannot be passed over in silence by a paper devoted to one of the great national industries, which has like all others been called upon to bear, both in purse and person, a proper share of the cost and burden of war. Many a gas worker has been called upon to drop the implements of his trade and take up the weapons which constitute the last argument of patriotism ; and it is not to be doubted that these recruits of the great army which England has kept in the field so long have proved their manhood as well as the rest. It is no small reason for thankfulness that the incessant growth of the gas industry while these men have been doing their country's work at the front, will facilitate the performance by their old employers of the duty of finding them suitable places upon their discharge into civil life. We trust it will not be taken amiss if we press upon employers the consideration that not merely reinstatement, but probably some little forbearance, may be called for in the case of certain men whose environment will have been so violently changed twice over within a brief period of a lifetime. The campaign, by common consent, was prolonged because our forces in the field, from the Field Marshal Commander-in-Chief right down to the private soldier, were slow to adapt themselves to the ruthlessness of war; and it is not easy for the average man to change his parts like an actor on the variety stage. As regards the money cost of the war, it is natural to hope that some of the future expenses for which the Chancellor of the Exchequer has had to provide in a way that has thrown a high light upon the national system of taxation, may now be dispensed with. It is satisfactory to reflect that, whatever the cost of the war in blood, individual suffering, and treasure, its objects have been attained; so that there are fresh assets to set off against the abnormal expenditure. Speaking generally, we may expect a strong revival of trade in many directions to result from the conclusion of hostilities. Yet it will be well to remember that peace does not always mean universal prosperity. It is not only that the circulation of a good deal of money automatically ceases with the termination of hostilities, but there are a good many involved interests which suffer when a strong current of gold that has been set flowing in a particular channel is checked. Still, let us hope that the wonderful spirit of the English race, which has borne us through the ordeal of the last two-and-a-half years with a steadfastness and serenity that have been a marvel to the world, will not fail the nation in the trials which Peace, no less than War, brings in its train.

Programme of the Gas Institute Meeting.

THE programme for the annual meeting of the Incorporated Gas Institute, which will be held at Southampton next Tuesday and the following days, under the presidency of Mr. S. W. Durkin, Engineer and Manager of the Southampton Gas Company, is detailed in an article which appears in another column, where also will be found the chief particulars of the affairs of the organization as recounted in the official report. It is with the greatest pleasure that we are able to compliment the Council and Executive of the Institute upon the excellent promise of the *agenda* prepared for this meeting, which bids fair to become an occasion of historic moment in the chronicles of the professional societies connected with British gas engineering. For, before the usual proceedings of the Institute at its ordinary meetings are entered upon, the members assembled are to be asked to deal, according to the constitution of the Society, with the negotiations relative to the amalgamation of the Institute with the Institution of Gas Engineers, and to vote upon two organic resolutions framed to clear the way for this most desirable consummation. The terms of the resolutions are printed on the cards of the meeting, with the order of proceedings. It is important to note that they are identical with those passed unanimously at the recent meeting of the Institution. If, therefore, the middle course thus marked out commends itself to the meeting, the effect will be that the Councils of both Societies will have precisely the same powers to act upon it. More than this it is unnecessary to say for the time being. The issue is at last defined; and the good sense of the personality of the gas industry assembled at Southampton may be trusted to make a wise decision.

It is gratifying to learn that the meeting is to be opened with a civic welcome, which will be heightened by a greeting from the Chairman and Directors of the Southampton Gas-light and Coke Company. Such a function is no novelty, of course, in the experience of the Institute, but is, indeed, rather a tradition, which ought on all accounts to be perpetuated. For the cultivation of gas engineering by technical gatherings is good for the community, as it is for the industry itself. Proof of this observation may be found in this year's list of papers and communications, which are both numerous and of high promise—exceptionally so, in point of fact. One of the chief features of the proceedings at the meeting will be the Wednesday morning's lecture by Mr. James Swinburne, entitled "Electric Traction and "Electrolysis." The name of the eminent expert who has consented to expound the intricacies of this pressing subject is a guarantee that there will be no inadequacy of matter nor ineptitude of style in this communication. The Council are also to be congratulated upon having obtained a paper from Mr. Dugald Clerk on a subject which he has made his own—"Large Gas-Engines and the Gases "Used by Them." The Institute's members have come forward well with papers having attractive titles. The steam-turbine is to be introduced to the gas industry by Mr. W. D. Child, of Romford. It is as yet a novelty in any factory, though much talked about for particular uses. The pressure of commercial considerations on the ordinary conduct of gas undertakings is manifested by the circumstance that no less than four papers are addressed to various aspects of the business of the distribution and sale of gas. A once familiar topic which has never lost its attraction for some practitioners is the automatic lighting and extinguishing of public lamps; and it is quite refreshing to find that it will be treated in one of the papers. The "Valuation of "Gas Oils," by Mr. J. P. Leather, of Burnley, should prove one of the most useful papers of the year. Mr. C. E. Jones has chosen a tough subject in the criticism of the gas capital of England and Wales. Why not Ireland and Scotland as well? Mr. R. G. Shadbolt, of Grantham, has a favourite and worthy topic in "The Sunday Rest of Gas Workers," in connection with which it is permissible to express the hope that something will be done to dispel the suspicion that municipal gas-works do not stand well in this matter. Mr. T. G. Marsh, of Manchester, is to describe a new method of gas measurement, which may herald a fresh departure.

In addition to the formal proceedings, it should be remembered that Southampton is one of the most ancient of English towns and ports, as well as being most beautifully situated and favoured by Nature in many respects. The incidental engagements offered to holders of the Institute cards are exceptionally attractive; and a long day's excursion to the Isle of Wight concludes the programme. Southampton, as a great ocean port and "stepping-off place" from England to the parts beyond all the seas is, moreover, a remarkable example of the successful application of private enterprise to preserve and develop geographical and maritime possibilities. Those who are strangers to Southampton town and "Water" will have an opportunity of seeing the locality at its best, thanks to Mr. Durkin's arrangements; and those to whom the place is familiar will not need urging to go there again under the same kindly auspices.

The Engineering Staff of the Birmingham Gas Department.

THE Corporation of Birmingham deservedly hold a leading position among British municipalities, for many and various reasons. They have just placed themselves upon a very high pinnacle indeed, in the estimation of those who follow

the profession of gas engineering in the United Kingdom, by the statesmanlike spirit in which they have effected the rearrangement of the engineering staff of their Gas Department, necessitated by the retirement, through efflux of time, of Mr. Charles Hunt. The business was finally disposed of at the last meeting of the City Council, as reported elsewhere, which affords us the opportunity for mentioning it here. As is well known throughout the profession, there have hitherto been two Chief Engineers to the Birmingham Corporation Gas Department, consequent upon the history of the undertaking, which was originally two independent Gas Companies. By a remarkable course of affairs, no vacancy has occurred until now in either of these chief offices; so that the duties have remained as unchanged as the incumbents. Mr. Hunt has hitherto been in charge of two works (Windsor Street and Adderley Street), with the assistance of subordinate officers called Superintendents; and Mr. Hack has had three works (Saltley, Nechells, and Swan Village), with similar help. A mass of detail work, however, dating from the old days when the concerns were much smaller, has been continued in the hands of the Chief Engineers; and there was nobody to relieve them of it, or to act on emergency as representative of the Chief. The retirement of the senior Chief Engineer, however, was a fit and proper occasion for the reorganization of the higher appointments in the executive branch of the staff of the Department; and this highly important duty has been performed by Mr. Hallewell Rogers and his colleagues, with the valuable advice of Mr. George Livesey, in a manner that silences all criticism. Mr. Hack, who has the entire confidence of the Committee, is appointed Engineer-in-Chief of the Gas Department at a salary of £1600 a year. For the future, the Works Superintendents will be styled Works Engineers, with more responsibility for details; and to one of the largest works—probably Windsor Street—an Assistant to the Chief Engineer will be appointed at a salary of £600 a year. This makes a satisfactory equipment of the executive branch of the Department. The new scale of salaries is adequate, without being at all lavish. There must be many industrial concerns in the Birmingham district which remunerate their technical heads more liberally; and there can be no question in the minds of the members of the City Council that the Gas Committee have, in this matter, effected an excellent arrangement for the Department.

Mr. Drory on Inclined Retort House Construction.

The inclined retort work of Mr. Edward Drory, the Chief Engineer of the Imperial Continental Gas Association, is the cynosure in that particular direction of all Continental gas engineers; and it will be this week of all British gas engineers. The contribution which he has kindly made to our columns is of the purest quality in its technical character; and engineers on this side, both favourable and otherwise to the inclined retort system, will welcome it as such, and will be thankful to the author for presenting them—with such exactitude and at the expense of so much trouble—with so beautifully illustrated an account of his work. Mr. Drory writes with a clearness of expression and openness of statement which evince his desire to make known all that is worth knowing other than minor detail; and therefore, if there are any points which engineers would like elucidated, or upon which they wish for further detail, we think a pledge may be given that Mr. Drory will supply whatever may be required. His sole desire is to give enlightenment from his experimental work and large practical experience as an engineer, constructor, and gas manufacturer; and, while doing this, he simply asks for a similar return from his fellow engineers.

The written part of the contribution clearly divides itself in to two sections. There is first the historical narrative of experimental investigation; and then the description of the constructional work—first of all at Vienna, then at the Gitschiner Strasse Gas-Works in Berlin, and finally at the Mariendorf station, at which in the new house are concentrated all the ripened views of Mr. Drory. The first part reveals a course of steady and patient investigation over a long series of years in Vienna and Berlin, as well as a kindly encouragement, by the Directors of the Imperial Continental Gas Association, to perseverance on the part of their Engineer. We will not derogate the interest which will be obtained from the reading of the article, and the studying of the drawings and photographs, by referring at length to their features here, but will merely touch upon one or two points for the purpose of bringing them more prominently to notice.

In connection with the historical portion of the article, it will perhaps be some little surprise to those engineers who fancy that tapered retorts are a comparatively recent change in an established practice in inclined retort installation, to find that Mr. Drory had them in use in 1892; but, from the measurement he gives for his retorts in his latest installation at Mariendorf, it would appear that he has now abandoned the taper and adopted parallel retorts. If this surmise is correct, we do not find any reason given for the change. Then the description of the new retort-house at Mariendorf contains two specially interesting features. The first of these is the peculiar form of construction adopted to carry out Mr. Drory's ideas in the matter of securing perfect ventilation. The house is constructed in two independent parts—the space between the benches and hoppers being absolutely free of any roof construction. Access is also given to large quantities of air in the lower part of the house, with the result, as Mr. Drory says, that the men are always working in a pure and comfortable atmosphere—a wholesome condition which is not always found to exist in inclined retort houses which are cramped in construction. To this improvement in the conditions of working, it may be remembered, Mr. Drory has previously partially attributed a decrease in the labour required in this house. The second feature is that the supports of the roof, the stages, and the coal-hoppers are quite independent of the benches; in fact, the latter have no weight to carry external to themselves. This, again, is an advantage, as very troublesome results have arisen from the sinking of inclined retorts through an excess of burden. One, however, could well wish that Mr. Drory had given a detailed account of the construction of the roof and of the supporting structure for the stages and hoppers; but he has partly compensated for this by setting out the costs. The table of the costs of construction is of great interest, and will be critically studied. It is to be hoped that Mr. Drory's request to his colleagues to publish their figures on corresponding lines will be complied with. Taken as a whole, the communication shifts attention for the moment from the inclined settings themselves to the external structure; and this Mariendorf house may mark the beginning of some very radical changes in this respect. At any rate, it opens up for engineers fresh ground for reflection and perhaps controversy. This is the second contribution we have had this year from Mr. Drory on the subject of inclined retorts; and we and our readers are grateful to him for them.

The Need of Efficiency.

On Thursday afternoon last, at the opening of the new premises of the London School of Economics in Clare Market, Lord Rosebery—in one of those non-political speeches of his in which so many delight—took occasion, as he always does, to emphasize the need in this country, and at this epoch, of a sound business training for "the captains "of our industry." He commented with much satisfaction upon the fact that 80 per cent. of the students already studying in the various courses at the School are actually engaged in business and administration, and that 150 of the students are employees sent by the Great Western Railway to study in one of the railway courses. He then went on jocularly to express the opinion that all Members of Parliament, "from the highest and most conspicuous to the humblest "and most obscure, might derive the greatest possible benefit "from attending some of the courses." But why jump at once from railway employees—the lieutenants of industry—to Members of Parliament, who can scarcely be described as its captains? Perhaps it was due to a delicate consideration for his fellow-administrators of the Great Northern Railway that Lord Rosebery did not mention the Directors of our large industrial enterprises as being persons who "might derive the greatest possible benefit from attending "some of the courses" at the London School of Economics! Or perhaps it was because he realized that the vast majority of the highly respectable gentlemen who occupy these remunerative positions are past benefiting by such instruction.

Whatever the reason—and the most probable one is that it did not happen to occur to him—it is a pity Lord Rosebery did not especially mention the "generals of industry" as being sadly wanting in "sound business training;" for the average incompetence of the directorate of almost every large industrial undertaking in this country (there are, of course,

striking but rare exceptions), is common talk in the business world, and is a serious bar to the prosperity of those undertakings. "Knowledge is Power," we all used to write in our copy-books; and the truth of the adage remains unimpaired. But, unfortunately, so many of those who possess the second do so, not because they have, but in spite of their being conspicuously lacking in, the first. Nowhere is general commercial knowledge, and an intimate acquaintance with all the special commercial information concerning the particular business involved, more urgently needed than in the board-room; nowhere is it, speaking generally, more conspicuously lacking.

This, of course, is only what would be expected when the qualifications required to be possessed by candidates for directorships are considered. For the posts of engineer, secretary, or manager, candidates are required to produce evidence of fitness and experience, and are selected, as a rule, after anxious consideration from out of a host of applicants. For the office of director, what qualifications, what evidence of fitness and experience, can the majority of the successful applicants produce; and by what process are they selected? How many gas directors, for instance, could say that before their election they had ever been inside a gas-works, or knew a retort from a condenser? And we have been called "a nation of shopkeepers"! Truly, we keep some of our shops in a very amateurish fashion.

We are, indeed, sorry that Lord Rosebery did not dwell at greater length, and in greater detail, upon his subject—the crying need of more scientific knowledge, of less amateurism, in every walk of the nation's business life. The advance of science and the increase of competition have rendered happy-go-lucky methods of business, unenterprising management, and rule-of-thumb engineering, hopelessly out of date; and in some way, through schools of economics, technical schools, secondary and higher-grade schools (we despair to speak of elementary schools, for the sectarian squabble now, as in the past, stands in the way of efficiency and coherence in our "system" of elementary education), by every possible means, existing and to be devised, we must obtain better raw material out of which to fashion the captains and the generals of industry. But the extinction of the guinea-pig species will be a long and difficult piece of work. Lord Rosebery would deserve the gratitude of the country if he would make one of "the guns."

A Conference on Municipal Trading.

THERE was a conference on the subject of municipal trading last week, at the Constitutional Club, under the auspices of the London Municipal Society. Sir Edward Clarke, K.C., the Chairman of the Society, presided; and the attendance was such as to testify to the importance of the question in the minds of practical statesmen interested in domestic legislative reforms. It is unfortunately too true that the affirmative position in regard to municipal trading has been taken possession of by one political party, which makes it extremely awkward for anybody wishful to treat it on its merits to do so without appearing to talk politics. Broadly speaking, the partisans of municipal trading belong to the Progressive party in local politics; and the distinction which it was once possible to draw between Progressivism and Radicalism has dwindled to a pretence in which nobody believes. This is largely due to the circumstances that the cause of Progressivism in local politics, while professing to be independent of party divisions, has always been engineered from the Liberal and Radical electoral associations, and its triumphs celebrated next day in the newspapers as Radical victories. The natural consequence has, of course, followed. Progressivism has been judged by the company it usually keeps; and its ideals must submit to be examined in the light of the known aims and predilections of their professors. Now, whatever else may be postulated of Radicalism in politics, it cannot be denied that it follows what its sympathizers call ideals; while its detractors are apt to stigmatize them as "fads." It takes up strenuously with what are recognized as "principles," and is often not a little impatient with opponents who desire to test these principles by acknowledged facts of experience.

Progressivism proclaims its affinity with Radicalism by going headlong after such a "principle" as that of the desirability of municipal trading, heedless of such considerations as proportion, expediency, necessity, or any other qualifying influences such as practical men of business and of affairs usually respect in the concerns of every-day life. We have on a previous occasion exposed the fallacy of the usual plea for municipal trading based upon the asserted success of municipal gas undertakings; the truth of this very favourite illustration of the "principle" being, of course, that the expediency of each of the cases has first been proved to the satisfaction of a Parliamentary Committee. Therefore, to pretend that the collective record of these examples justifies faith in the principle, is to put the cart before the horse. The expediency of any number of gas-works municipalizations would not justify one inexpedient transaction of the kind. This is the view of the subject that commends itself to the London Municipal Society, and was expounded at the recent conference by Major Darwin, who was disposed to hold that, in general, such undertakings as gas, electricity, and tramways should be left in the hands of private companies. Yet he was quite willing to grant that in some places such enterprises would be better in the hands of the local authority, and was content that every case should be dealt with on its own merits. Mr. Whitmore, M.P., held the same view, declaring that no hard-and-fast *a priori* rule can be laid down as regards the relative merits of municipal and private enterprise for a community. "As long as they "could keep private enterprise working well, they should do "so; but they must not declare that all municipal enter-"prise was bad."

These would appear to be fairly liberal opinions, not at all savouring of an attempt to meet prejudice with prejudice. Sir John Dorington, M.P., followed with an observation which went directly to the root of the economics of the question. He said that he was strongly of opinion that to make use of municipalities for all purposes is undesirable from a social point of view, "because of its tendency to "restrict individual enterprise, and because it is very apt to "burden the ratepayer with the cost of enterprises which "he could not touch himself, and which are bound to be "financially disastrous to the community." That is the sore point. Stripped of all their trimmings, most of the Progressive demands for municipal action in certain directions can be shown to be a desire to have done at the public charge what nobody would do on his own account. It is the same with the very popular notion that a municipality ought to be a "model employer," if this means that the rate-aided pay-sheet is to be on a more liberal scale than the employer with a living to make and rates to pay can afford. Sir Edward Clarke contributed to the proceedings of the conference a few remarks worthy of his high reputation. He pointed out that one of the greatest dangers of municipal trading lies in the risk of its bringing into the direct service of the municipality a large part of the population, which must lead to corruption and maladministration. He also contended that the accounts of every form of municipal enterprise should be kept absolutely separate and distinct, and that the profits upon each branch thereof should be devoted to the purpose of that particular undertaking. Subject to these, and other propositions which a strong Parliamentary Committee ought to be able to lay down for its control, and within the limits of what might be regarded as monopolistic trading, Sir Edward thought that municipal trading might not only be allowed, but in some respects would be advantageous. This is an open-minded piece of counsel which contrasts favourably with much that has been put forward in the sacred name of Progress.

Statutory Powers of Rural District Councils.

THE Rural District Councils Association met at the Westminster Palace Hotel last Wednesday, under the presidency of Sir Edward Strachey, M.P.; and the gathering is noteworthy for two reasons. In the first place, it is an additional proof of the existence, on the part of all scattered bodies of the kind, of a feeling of the necessity for combination for the attainment of common ends; and, secondly, this particular meeting was signalized by the raising of a matter of intimate importance to gas companies. It is on record that the Isle of Wight Rural District Council failed to obtain the consent of the Local Government Board to their proposal to purchase the undertaking of a Gas and Water Company which is carried on as a joint business. The Gas and Water-Works Facilities Acts do not apply to Rural District Councils, which usually have nothing to do with public lighting. There are districts, however, where the rurality is tempered with gas lighting; but even so, the Rural District Council has no right of action under the Acts named. This

condition appeared to the Isle of Wight Rural District Council to be a vexatious anomaly; and they appealed to the Local Government Board to take action to remedy it. The response was to the effect that there is no evidence of the existence of such a general desire among Rural District Councils to have the power to purchase gas undertakings as would warrant the introduction of a Bill on the subject. Hereupon, the Isle of Wight Rural District Council moved their Association to take action in the matter; and a resolution was duly passed at the meeting, calling for "the removal of the anomaly." That is how the case strikes an Association at the suggestion of one member. Of course, the resolution of the Rural District Councils Association may mean nothing at all; but, on the other hand, it may have a greater influence than the merits of the particular instance warrant. There are not many rural places in the kingdom comparable to the Isle of Wight. But there are a good many tiny gas-works in country places all over the kingdom, some of which have dropped into a very sere aspect of existence. It would be a grave matter to expose Rural District Councils everywhere to the temptation of being asked to buy these deplorable properties. It is part of the charm and safeguard of Rural District Councils that they cannot commit their constituents to anything very serious in the way of a trading enterprise. Consequently, the village sexton and the village shopkeeper are equally eligible for membership in a body which can very well be useful without going into trade. To force on such elementary governing bodies the duties of town authorities would in many instances wreck them; and it is surprising that no reflection of this kind occurred to Sir Edward Strachey's associates. As for the Isle of Wight Rural District Council, they can always promote a Bill in Parliament if they think they have a chance of carrying it.

The Report of the Comptroller-General of Patents.

THE nineteenth report of the Comptroller-General of Patents, Designs, and Trade Marks has been issued, and furnishes food for much reflection on the part of those who are interested in the important subjects of which it treats. We are not of those who take an exaggerated view of the functions of a Patent Office, and are very far indeed from the standpoint of the enthusiasts who affect to hold a system of patents for inventions as forming one of the chief sources of national industrial prosperity. Still further removed, if possible, are we from those who scorn and condemn our patent system, and those deserving officers of the State who carry it out, and argue—usually from scant knowledge—that the patent systems of almost every other country are better. This is emphatically not true. There are among us a few "cranks" who belaud the American system under which an applicant may languish ten years for his patent, and then get a bad one; or pretend affection for the French or German Patent Offices, which is not universal with the natives of these two great countries. But we are free to maintain that for simplicity, honesty, and, above all, for the assistance which is rendered at a low charge, or even gratis, to well-meaning applicants, the British Patent Office is second to none. Of late years the publications of the Office have rapidly increased in number and usefulness.

The influence of fashion in the business of the Patent Office has been as marked as usual. This fact ought to go far to demolish the fantastic notion entertained by some persons, that a patent system is an originating cause, or even an encourager in any particular degree, of invention. The vogue of the bicycle has simmered down, and consequently there has been a marked falling off in the number of inventions relating to it. The aspirations of applicants who sought fortune by the way of acetylene patents have also fallen low. Of coin-freed appliances there is a diminishing tale; while certain classes of electrical apparatus are in higher favour than ever. Steam engines and boilers are among the classes of inventions which are now at their maximum in point of number. Iron and steel manufacture is also to the front. Gas manufacture keeps up a good average, and the same may be said of gas distribution. Air and gas engines make a fairly large class. Lamps, also, are well up among the most numerous classes of the year—being, indeed, outnumbered by few.

The Naphthalene Trouble.

In the "JOURNAL" to-day will be found a "Communicated Article" from the pen of Dr. Harold G. Colman, on the "Condensation of Coal Gas." In it the author sets forth the conclusions to which he has been led, by a study of the literature of the question and his own experiments, with regard to the subject—especially from the point of view of the complete removal of naphthalene in the process. Any contribution calculated to throw light on the ever-present naphthalene difficulty is of supreme importance generally; and therefore it is unnecessary to commend Dr. Colman's communication to the careful attention of our readers. Valuable as the article is, however, it would, of course, have been rendered more complete had it been possible to furnish results obtained on the large scale, for in condensation, which depends so much on exact conditions, small-scale experiments cannot be regarded as absolutely convincing. Herein, it need hardly be remarked, lies one of the great difficulties in the way of satisfactorily solving the naphthalene question. Large-scale experiments demand a very considerable outlay of money; and there is a not unnatural hesitation on the part of a single gas undertaking to incur the necessary expenditure, unless a successful outcome is fairly certain. But it should be easily possible for a combination of interested parties to accomplish what it would be very difficult for one company or corporation alone to do; and thus it seems only reasonable to hope that much good will result from the action of the Southern District Association in appointing a Committee to investigate this vexed question. Under this arrangement, the cost will be shared by those who will benefit by a successful issue of the inquiry; and therefore it should not be too much to expect that all who suffer from the naphthalene trouble will assist in the investigation as far as they are able.

Coal Miners' Wages.

The adjourned meeting of the Coal Conciliation Board was held last Thursday, to receive the report of the representatives of the coalowners and workmen as to the acceptance or refusal by their constituents of the proposal to reduce wages from 60 to 55 per cent. above standard as from the first making-up day in June, and from 55 to 50 per cent. above standard as from the first making-up day in August. As we anticipated last week, the representatives of the men voted against the reduction (in accordance with the result of the ballot already taken at the collieries) and the owners in favour of it. The matter has, therefore, been referred to the arbitration of Lord James of Hereford, who will meet the parties within three weeks from Thursday last, and give his decision. There is no reason to fear any further opposition to the reduction if it be awarded by Lord James. In the meantime, the case of the owners has been further strengthened by the fact that, as a result of the audit of the books of the Associated Coalowners of South Wales for March and April, wages in the South Wales coalfields will be reduced, as from the 1st inst., from 53¾ to 48¾ per cent. above standard—making a total reduction of 30 per cent. on the standard rates, or about 17 per cent. on actual wages, from the highest rates paid during the "boom."

Incandescent Burner Maintenance.

No one can wish the Gaslight and Coke Company anything but success in their practical effort, by means of the system of incandescent burner maintenance, to be of service to the consumers. Since this system was first suggested, we have regarded it as a channel by which gas suppliers can be brought into more intimate communication with their customers; and, though the profit on the transaction may be *nil*, it affords the means of rendering a service which will bring about among consumers better, if not entire, satisfaction. The Gaslight and Coke Company have the advantage of the experience of others in deciding upon the conditions of their maintenance scheme; and an outline of the terms which they have adopted may be useful to other concerns who are contemplating taking up this branch of the work of a gas undertaking. The charge for the service is, experience shows, far from being the only thing which requires consideration. As mentioned last week, the Company are making an inclusive charge of 9d. per quarter per burner; but consumers with less than four burners are to be charged a minimum rate of 3s. per quarter. Competent workmen (in uniform) are to visit the houses of the consumers periodically; and, for the charge named, they will clean and regulate the burners, renew any ordinary sized mantles which may be worn out or be otherwise defective,

clean the chimneys, and replace any which may be broken. In the paper of terms, consumers are informed that should mantles or chimneys be required in the interval between the inspections, they will be promptly supplied on receipt of a post card; but no claim for mantles or chimneys purchased by consumers will be entertained. For breakages caused by carelessness, there will be an extra charge made. The Company are also undertaking the repair and replacement of burners at cost price. Of course, the maintenance will only be undertaken after the burners and mantles are found to be in, or are put into, thorough order; and the Company will only enter into an agreement to maintain the whole of an installation, and not part of one. A month's notice (in writing) of discontinuance is to be given by either party. It is pretty clear that it is necessary for gas companies to hedge themselves round with protective conditions.

The Testing of Gas Coal.

The quality of the gas manager's raw material is a matter of vital importance to him. Most large works are equipped with the necessary plant for testing the coal on its delivery: but where this is not provided, dependence has to be placed upon the analyses supplied by the merchants and upon working results. In any case, the subject is one of interest for all who have charge of gas-works; and therefore attention may be directed to a paper contributed to the proceedings at the meeting of the Institution of Mining Engineers in London last Friday by Mr. G. P. Lishman, an abstract of which appears in another column. The author points out that the cause of the difficulties attending the testing of gas coal in experimental plants may be summed up in the single word "temperature;" and in this respect a small apparatus is much more readily affected by external conditions than a large one. Of course, though it is not possible, in designing coal-testing plant, to make it a model of full-sized gas-works, the same broad outlines should be retained. Mr. Lishman describes in his paper the arrangements made at the Lambton Collieries for testing gas coal; the apparatus in use being one constructed on an improved principle. The author advocates having a standard coal, selected from some special seam, and comparing the analyses therewith. He considers that by proper condensation, the use of the standard, and careful attention to the heat of the retort, gas coals can be somewhat finely discriminated by a laboratory method. Having a standard coal he regards as being absolutely essential to success.

When Judges Differ.

If anything were needed to demonstrate the oft-proved fact that the Workmen's Compensation Act is an ill-drafted measure, the history of the case of *Cooper and Crane v. Wright* would (says a writer from the Temple in the "Daily Telegraph") surely do so. As he remarks, differences of opinion among judges are not to be wondered at when complicated questions of equity or common law are involved. But it is certainly a matter of surprise that the greatest legal intellects of the day should find themselves in disagreement over the meaning of an expression in a statute which was supposed, and intended, to be plain to persons of the humblest capacity. In construing the word "undertaker"—notwithstanding the fact that the Act provided them with a definition of the expression—nine distinguished lawyers have divided themselves into two hostile camps. As so often happens when there is protracted litigation, the vanquished party has the preponderance of judicial authority on his side. The defeated majority consists of Lord Brampton, Lord Robertson, the late Master of the Rolls, Sir Richard Henn Collins (Master of the Rolls), and Lord Justice Romer. The victorious minority are the Lord Chancellor, Lord Davey, Lord Shand, and His Honour Judge Masterman.

The Cost of Transfer Arbitrations.

Attention was drawn recently in this column to the great expense frequently incurred in arriving at the price to be paid on the transfer of gas and water undertakings to local authorities. In this connection, reference was made to a recommendation by the Water Committee of the Shepton Mallet District Council, with a view to avoiding heavy law costs in determining the amount to be paid for the works of the local Water Company. This appeared to us to be an excellent example, in regard to the transfer of small undertakings—both gas and water. We have since learned that an arbitration is in progress to settle the price to be paid by the Local Authority for the undertaking of the Cromer Water Company; but as the matter is *sub judice*, it is at present impossible to obtain full particulars of the proceedings. It may, however, be stated that the parties agreed that the arbitration should be of an extremely simple character. Mr. E. M. Eaton is officiating as Arbitrator for the Company, and Mr. Henry Rofe for the Urban District Council; while Mr. Ram, K.C., acts as Umpire. The arrangement was that no Counsel were to be employed, and that there were to be very few witnesses. It is thought probable that the award will not be given until the autumn; but whenever it may be made known, we shall hope to publish a report of the proceedings, for the purpose of indicating to those concerned how an arbitration of this character can be conducted at a minimum cost, compatible with efficiency. The cutting down of expenses is sometimes a dear process in the long run; but who shall say that the eminent Arbitrators and Umpire mentioned above are not quite capable, after having put before them a plain statement of the facts of the case, of satisfactorily performing the work expected of them? Though the Cromer Water-Works Arbitration may not form a precedent which can be followed in every instance, it cannot be doubted that—more especially in regard to small transfers—the method adopted constitutes a move in the right direction.

Gas Affairs in Monte Video.

All things considered, the report presented to the shareholders at the annual meeting of the Monte Video Gas Company last week must be regarded as satisfactory. Taking into account the growth of incandescent gas lighting, an increase of nearly 7 per cent. in the sales of gas over the twelve months is a very fair achievement. There is, however, one feature of the business—and it is a far too common feature with gas companies whose undertakings are situated in South America—that cannot be looked upon as being satisfactory. This is the proposal that the creditors of the Government—of whom, of course, the Company is one—should make a reduction of 9 per cent. in their claims, and that the balance should then be paid by an issue of bonds. As the Chairman very justly remarked at the meeting, this does not seem a particularly equitable arrangement for a solvent debtor to make with his creditors. It is greatly to be regretted that some means cannot be found of forcing the Governments of that part of the world to fulfil their obligations, though in the case of the Monte Video Gas Company it is to be noted that hitherto the Government debts have always ultimately been satisfied in some way or another. In England, we are not in the habit of regarding electricity as constituting a serious danger to the gas industry; but the Monte Video Gas Company can hardly be expected to view matters in the same way, seeing that their annual bill for public lighting has been reduced from £20,000 (at which it used to stand) to £265. Under these circumstances, it is in the direction of private consumption that the Company have to look to increase their business; and it is gratifying to find that they do not look in vain.

WATER AFFAIRS.

The Progress of the Water Inquiry.

THE Joint Committee on the London Water Bill resumed their inquiry last Tuesday afternoon, and proceeded to consider the clause dealing with the subject of arbitration. As printed, it consisted of eleven sub-sections, and they gave rise to a good deal of discussion. The Court of Arbitration proposed in the Bill is composed, as our readers may remember, of three Commissioners; and provision is made for the Court to act by two of their number. The first tussle was over an amendment submitted by the Water Companies, to the effect that the Commissioners should all sit together, but that the decision of the majority should be binding. Mr. Fitzgerald, for the Local Government Board, declined to accept the proposal; and he was supported by the Committee—their opinion being that the matter might be well left to the discretion of the Arbitrators. Two amendments next proposed to the sub-section providing that every award of the Court of Arbitration should be binding, and should not be removable into any of His Majesty's Courts, gave rise to some controversy. The purpose of the amendment was to afford

facilities for testing an award; and the position taken up by the Water Companies was supported by the London County Council. On behalf of the Local Government Board, it was submitted that the proposals would have the effect of delaying the proceedings; and, eventually, the matter was allowed to stand over for arrangement between the parties.

The most important discussion during the first two days' sittings took place on an amendment that was brought forward by Mr. Pember to the sub-section giving specific directions to the Arbitrators as to what they are to take into account in arriving at the compensation to be given to the Companies for their undertakings, and another that was submitted by Mr. Fitzgerald in regard to the same matter. The difficulty arose as to the exact phraseology to be adopted. Mr. Pember wished that the Court of Arbitration should "award to each Company compen- "sation," as if the Lands Clauses Act were applicable to the case. Mr. Fitzgerald proposed that the Court should "determine the sum to be paid" to the Company. But Mr. Balfour Browne, for the County Council, did not like the word "sum," and suggested "value of the undertaking" —*i.e.*, to the seller. In the result, the Committee decided that, in fixing the sum to be paid, the Court are to "deter- "mine the value of the undertaking as if, with the necessary "modifications, the law of compensation for the purposes "of the Lands Clauses Act were applicable to the case." This was a very important point settled. Another was disposed of at the instance of the Barnet District Gas and Water Company, who, with the support of the London County Council and the counties of Berkshire and Wiltshire, obtained the deletion of a portion of a clause giving power to the Local Government Board to repeal, on the application of the Water Board, any enactment relating to the Water Companies contained in any Local Act.

The Committee made such good progress with the clauses during the remaining sittings in the past week, that by Friday afternon they had disposed of them, and commenced the consideration of the new ones. This was a great deal more work than we supposed they would be able to get through when writing on this subject last Tuesday. The two salient features in this portion of the inquiry were the definite settlement of the "appointed day," and the decision as to the Companies' cash balances. It may be remembered that the date originally named in the Bill for the transfer of the undertakings was Jan. 1, 1903, or some other day within twelve months. We urged at the time that the date was ridiculously early, and suggested a year later. The Government met the suggestion half way by naming June 24, 1903. But this did not satisfy the Companies; and the Committee eventually fixed Dec. 25, 1903, or such later date within eighteen months as the Local Government Board decide. Consequently, the Department may postpone the transfer day till June, 1905. With regard to the cash balances, the Companies claimed that these, as well as the reserve funds and investments, should remain their property, as being no part of the undertaking itself. In the result, the Committee declined to amend the Bill in this respect.

Another matter of considerable interest arose on the clause dealing with the existing officers and servants. The two eminent Chemists who make daily analyses of the water supply for the Companies had asked to be heard as to their position under the Bill, and they were allowed to give evidence. Strictly speaking, they are not officers of the Companies, inasmuch as they are not under their orders; but they desire, for the purposes of compensation, to be so regarded—not for any purely personal consideration, but merely with the view to the maintenance of the department. The Chairman said the Committee recognized the importance of the work carried on by Sir William Crookes and his colleague, and they thought the Bill should contain some assurance that this would be done. The matter was left for the parties to arrange. With regard to the officers and servants generally, the Chairman said it was the wish of the Committee to see them put in at least as good a position as they would be in if no such Bill as the one before them had been proposed. Mr. W. B. Bryan and Mr. T. F. Parkes, the Engineers respectively of the East London and Lambeth Companies, gave evidence, and a clause dealing with the matter was agreed between the parties, but not finally adopted, in deference to a desire expressed on behalf of the London County Council that they might have an opportunity of considering it. This practically closed the Committee's labours for the week.

Two Water Companies' Meetings.

By a singular coincidence, the Chairmen of two of the London Water Companies were addressing the proprietors at precisely the same moment last Tuesday, and that moment was not long anterior to the re-assembling of the Joint Committee whose proceedings are dealt with in the preceding paragraphs. It was only natural that a large part of each address should have been devoted to the all-important subject of the inquiry now in progress, although the remarks of one of the speakers came somewhat as a surprise. It was announced in our "Personal" column last week that Viscount Hampden had been chosen as the new Chairman of the Lambeth Water Company; and the occasion of his first appearance in that capacity was marked by two events which ought not to pass unnoticed. As far as we are aware, it has hitherto been the invariable rule of this Company to hold their half-yearly meetings with closed doors. Of course, they had a perfect right to do this, and to justify their action. At the same time they were following a course which was calculated rather to arouse the suspicion than to inspire the confidence of the general public. Last Tuesday, however, the meeting was an open one, and the Chairman made a speech which must have caused some of his auditory to prick up their ears. He denounced the Government and their Bill, and spoke scornfully of the Water Board proposed to be created under it. So unsuitable would it be, in his individual opinion—and he was careful to dissociate himself from his colleagues in this matter—for its work, that he would prefer the London County Council, as being the only authority whose position and experience entitled it to have charge of the water supply in the London area; provision being made for the representation of the outside area and any other interests that might be affected. It was a remarkable confession to come from the Chairman of a London Water Company. With much that was said against the Bill we cordially approve. We do not, for instance, believe that its passing will benefit either the consumer or the ratepayer. But we cannot endorse the remarks made in reference to the Chairman of the Committee to whom it has been referred. We acknowledge to sharing the confidence of the general body of Directors of Water Companies in Lord Balfour of Burleigh, who, it seemed to us, was specially fitted, by previous experience, to conduct the present inquiry; and we are not aware that his Lordship has done anything to justify a withdrawal of that confidence. Viscount Hampden had not much to tell about the affairs of his Company, but what he did say indicated continued progress. The population now supplied is about equal to that of all London a century ago.

The other meeting held was that of the West Middlesex Water Company, whose Chairman—Mr. E. Boulnois, M.P. —also discoursed upon the defects of the Government Bill. He was less censorious than his colleague on Brixton Hill, and he also indicated the points in which the measure had been amended to the benefit of the Companies. Since he addressed the shareholders, further changes have been made. However, the whole matter is, so to speak, *sub judice;* and it is scarcely possible to estimate the full extent to which the Bill may be altered in shape by the time it reaches the report stage. With respect to the working of the Company, Mr. Boulnois announced that all their supplies—88,422 in number—have now a constant service of water; and if the Directors had not been compelled to reduce from 10 to 5 per cent. the rebate allowed to the consumers, there would have been nothing to cause a word of complaint from them. Even as it is, they get 5 per cent.; so that they are not very badly treated. Rates and taxes rise every year, as householders too well know; and the Company have to bear the increased burden, as well as the annual payment to the Chamberlain of London—a tax which, as Mr. Boulnois pointed out, no other class of industrial undertakings in the country have to pay. It is not unreasonable, therefore, that they should resort to a perfectly legitimate means of lightening it. As partners in the Staines reservoirs scheme, the Company have to sustain a large expenditure which is not for the time remunerative. They have the gratification of knowing, however, that when completed it will place at the disposal of the three associated Companies such an additional bulk of water as will ensure for some years to come the full and uninterrupted supply to which the consumers in the Metropolis are accustomed. With all the drawbacks, however, the Directors were able to recommend a dividend for the half year at the rate of 10 per cent. per annum.

ESSAYS AND REVIEWS.

THE LEGAL RELATIONS BETWEEN GAS SUPPLY UNDERTAKINGS AND CONSUMERS.

THE articles which we published last February, upon the legal position of gas supply undertakings in regard to consumers who are in financial difficulties (*ante*, pp. 336 and 404), have—judging from references made to them by several correspondents—been found of sufficient value to warrant the belief that our readers would find useful a series of articles bringing together in some definite order, and summarizing, the various sections of the several Acts of Parliament which bear upon the legal relations existing between a gas undertaking and a consumer, from the day the latter applies for a supply of gas to the day he ceases to require (or the undertaking is obliged, and is entitled, to refuse to continue) that supply. These articles, it must be understood, are intended primarily to point out what the legal rights of the gas supplier are, without regard to whether it is always, or even generally, good policy to insist upon the full measure of any of those rights. We may, in regard to some of these rights, point out occasions on which it would certainly be wise not to press for them; but our not doing so is not to be construed as implying that the legal is necessarily the wisest course to follow.

It is only proposed to deal with the legal relations to their consumers of gas companies to which the provisions of the Gas-Works Clauses Acts of 1847 and 1871, and the Sale of Gas Act, 1859, apply; due note being taken of any modification or extension of those provisions in the case of the Metropolitan Companies under the Metropolis Gas Act, 1860. In respect to any particular company, therefore, the following statement of the law must be considered to be open to revision where it is inconsistent with the provisions of the company's Special Acts.

POWERS TO SUPPLY.

The gas company is authorized (G.C. 1847, s. 13; M.G. 1860, s. 19) to enter into any contract with any person for the purposes of lighting or supplying with gas any public or private building, or any street within the limit of the Special Act; and of providing, keeping in repair, cleaning, lighting, or extinguishing lamps, lamp-posts, pipes, meters, fittings, burners, or other apparatus. That is to say, the company is legally entitled to undertake to provide an intending consumer with everything he requires to enable him to use gas for any purpose. It is not, however, legally bound to do nearly so much.

OBLIGATIONS TO GIVE A SUPPLY.

What the company is bound to do, and that only upon the fulfilment of certain conditions by the person desiring a supply, is (G.C. 1871, s. 11) to give, and continue to give, a supply of gas to the owner or occupier of any premises situate within 25 yards of any of the company's existing mains, and furnish and lay any pipe that may be necessary for any such purpose, provided that the cost of so much of any such pipe as may be laid upon the property to be supplied, and of so much of any such pipe as may be laid for a greater distance than 10 yards from any pipe of the company, though not on such property, shall be defrayed by the owner or occupier. (As to obligations to supply meters, see *post*.)

In the case of a metropolitan company, the obligation imposed, by M. G. 1860, s. 14, is to provide and lay, at the company's expense, all proper and sufficient communication, service, and other pipes up to the premises of, and supply gas to, any owner or occupier whose premises are within, or partly within, their district, and lie within 50 yards of any existing mains, and who will contract for not less than two years to pay gas-rates in respect of such supply to an amount equal to 20 per cent. upon the outlay. Section 15 further provides that the owner or occupier, if so required in writing by the company, must also, as a condition precedent to being granted a supply, give security for the payment of gas-rate and meter-rent.

Conditions to be Fulfilled by Consumer.—The conditions imposed by G. C. 1871, s. 11, upon the person requiring a supply of gas are: (*a*) To serve a notice upon the company at their office, specifying the premises in respect of which the supply is required, and the day—not being an earlier day than a reasonable time after the date of the service of the notice—upon which the supply is required to commence. (*b*) To enter into a written contract with the company, if so required, to continue to receive, and pay for, a supply of gas for a period of at least two years, of such an amount that the rent payable for the same shall be not less than 20 per cent. per annum on the outlay incurred by the company in providing any pipe to be provided by them for the purpose of such supply. (*c*) To give to the company, if required, security for the due payment of accounts in respect either of pipes to be furnished, or gas to be supplied, by them. The consumer must also, if required, agree to consume the gas through a meter certified to be correct within the meaning of the Sale of Gas Act (M.G. 1860, s. 18; G.C., 1871, s. 13).

Notice of Supply Required.—As to what constitutes "a reasonable time" after the date of the service of the notice that depends upon circumstances. If there be no existing service laid to the premises, the seven days (or, if security be required, fourteen days) specified in the Metropolis Gas Act, 1860, s. 17, would probably be allowed to be a reasonable time. But if the service merely requires reconnection, only such time as would enable the company to ascertain whether the applicant was entitled to a supply (in the event, for instance, of the applicant being an Official Receiver) would probably be deemed reasonable, provided, of course, that the required security, if any, had been deposited. The time limits set out in the Metropolis Gas Act (s. 17) within which the company must give a supply, or render themselves liable to penalties, have been held to be superseded by section 11 of the 1871 Act (which allows only "a reasonable limit"), except in the case of the Commercial Gas Company, to which the provisions of the 1871 Act do not apply. *South Metropolitan Gas Company v. Noakes* (1889), 61 L.T.R. 556.

Contract.—None of the General Acts contains a statutory form of contract to be signed by consumers. Such a form will, however, be found in the second schedule to the Gaslight and Coke Company's Act of 1870, by section 12 of which that Company is empowered to require every consumer to sign such a contract, and to refuse to supply gas to any consumer objecting and refusing to execute the statutory contract. The Metropolis Gas Act provides (s. 21) that no contract for the supply of gas, &c., shall contain any term or condition giving, in case of difference, the sole arbitrament thereon to the company, or to any officer or person who is or has been employed by, or may have a pecuniary interest in, the Company. Contracts for the supply of gas need not be stamped; being for the sale of goods within the meaning of the Stamp Acts. Nor need they be under seal. (*Church v. Imperial Gaslight Company* [1837] 6 A. and E. 681.)

Security.—As we have seen, any owner or occupier desiring gas must, if required, give security before the company can be compelled to supply. Further, after a supply has been given, the company may, if no security has been previously required, at any time give seven days' notice in writing* to the consumer that security must be lodged; or, if security has been already deposited, and such security has become invalid, or is insufficient, give seven days' notice requiring new or additional security. In the event of the consumer failing to comply with the terms of such notice, the company may refuse to continue to supply the premises of the consumer so long as such failure continues. (G.C. 1871 s. 11.) Security for the payment of gas-rates or meter-rent may be by way of the deposit of a sum of money or otherwise, and of such amount as the consumer and the company may agree on, or as, in default of agreement, may be determined, on the application of either party, by two Justices or a Metropolitan Magistrate, who may also order by which of the parties the costs of the proceedings shall be paid, such decisions being final and binding on all parties. (G.C. 1871, s. 16.) The Metropolis Gas Act, s. 16, provides that a Magistrate may determine the nature as well as the amount of the security—whether it shall be by way of deposit with the company or with a third party, or of prepayment to the company, of a sum of money or any other security the Magistrate may think sufficient and reasonable. It further provides that, if the security be the deposit with the company of a sum of money, the company shall pay interest thereon to the consumer at such rate (usually 5 per cent.) as the Magistrate may determine.

Use and Supply of Meters.—Every consumer shall, if required by the gas company, consume the gas through a meter duly stamped under the authority of the Sale of Gas Act, 1859, and being a legal meter within the meaning of that Act. (G.C. 1871, s. 13.) Any consumer may, if he thinks fit, purchase and use for the measurement of the gas supplied to him any such meter, provided that the gas consumed per hour shall not exceed the quantity per hour the meter is intended to measure, so marked on the outside thereof (S.G. 1859, s. 16).

The gas company may let for hire any meter and any fittings thereto (including stoves: see *Gaslight and Coke Company v. Hardy* [1886] 17 Q.B.D., 619) for such rent, and on such terms with respect to the repair of the meter or fittings and for securing the safety and return of the meter, as may be agreed upon between the company and the hirer (G.C. 1871, s. 18), and must, if required, supply a meter to any owner or occupier entitled to a supply of gas; provided that such owner or occupier shall, if required, previous to receiving the meter, give security for the hire or purchase thereof. (See "Security," *ante* [G.C. 1871, s. 14]). By the Metropolis Gas Act, section 14, it is provided that the company is not bound to supply more than one meter for each consumer occupying a separate dwelling or apartment, nor any meter exceeding a 5-light meter. But, as this second provision appears to be inconsistent with section 14 of the 1871 Act, which says "a meter," without any limitation as to size, and only subject to the proviso as to giving security for payment of rent, it is open to doubt whether a Metropolitan Company could refuse to supply any size of meter required by the consumer. The company may charge for fixing meters, and recover such charges in like manner as a penalty under the Act (G.C. 1871, s. 40).

* Every such notice shall be served by being delivered to the person for whom intended, or by being left at his usual or last-known place of abode, or sent by post to such person, or if such person or his address be not known to the company, and cannot after due inquiry be found or ascertained, then by being affixed for three days to some conspicuous part of the premises to which such notice relates. (G.C. 1871, s. 45). Where an Act required notices to be served "personally, or by delivering the same to some inmate at the place of abode," it was held that the place of business is the place of abode, that a clerk is an inmate there, and that a man may well have two places of abode—one where he abides by day and one where he abides by night. (*Mason v. Biddy*, 33 L.J., M.C., 105).

Penalty for not Supplying Gas or Meter.—For neglect to supply such meter as the company is required by the Metropolis Gas Act to furnish, the penalty that may, on a summary conviction before a Magistrate, be imposed is the same as for a failure to give a supply of gas—namely, a sum not exceeding £2 for every day during which the default continues after the expiration of "a reasonable time" (G.C. 1871, s. 11 & s. 36), or (M.G. 1860, s. 17) of seven days (if no security has been required), or of fourteen days (if security has been required and given)—since the date of notice requiring the meter or supply of gas was delivered.

The Definition of "Owner and Occupier."

There are, however, other important points to be considered besides the question of whether the conditions already set out have been fulfilled, or their fulfilment has been offered, by the person applying for a supply of gas, before it can be said with certainty that the company is legally obliged to grant him such a supply. The company is bound (subject to conditions aforesaid) to supply the "owner or occupier" of any premises within its district and within 25 yards of its existing mains. The important point to be considered in regard to certain applicants is: Are they owners or occupiers within the meaning of the Act? The particular cases where this question is of importance were discussed in our previous articles, so need only be summarized here.

A Trustee under a Deed of Assignment, taking possession of the premises, and carrying on the business of a consumer indebted to a gas company, is not an "occupier" entitled to a supply of gas unless he has entered into a new and personal tenancy agreement with the landlord. Otherwise, the debtor remains the legal occupier of the premises, and the trustee can only obtain gas in the name of the debtor. The Company can, therefore, cut off the supply if all arrears due are not paid.

An Official Receiver is not an occupier entitled to a supply of gas so long as the debtor has not been adjudged a bankrupt. (*Smith, ex parte Mason*, [1893] 1 Q.B.Div. 323). Where the debtor has been adjudged a bankrupt, the Official Receiver or Trustee in the Bankruptcy is probably a new occupier entitled to be supplied with gas, though there is no judgment on that immediate point; and as we have previously pointed out (*ante*, p. 404), there is ground for argument. The judgment in the water company case, *Re Flack, ex parte Berry* (1900, 2 Q.B.Div., 32) is in favour of the Official Receiver.

A Trustee under a Composition or Scheme of Arrangement is in the same position as a Trustee in Bankruptcy; the property vests in him by virtue of the Bankruptcy Act, 1883, sec. 18 (sub-secs. 12 and 13) and sec. 54.

Receivers for Debenture Holders are not occupiers entitled to a supply of gas (*Paterson v. Gaslight and Coke Company* [1896] 2 Ch.Div., 476), even though the order of the Court appointing the receiver requires the company to deliver up possession of its property to the receiver (*Husey v. Gaslight and Coke Company*, *ante*, p. 353).

Mortgagees in Possession are apparently new owners and occupiers, entitled to be supplied with gas.

A Receiver under a Mortgage Deed is not an "occupier;" being only agent of the mortgagor. (Conveyancing Act ,1881, sec. 24, sub-sec. 2). This is determined, moreover, by Paterson's case.

An Official Liquidator is, so far as can be inferred, not an "occupier;" being only in the position of a caretaker for the shareholders and creditors. There is no judgment on this point.

Obtaining or Manipulating Supply by Fraud.

Having dealt with the questions of who is and who is not entitled to claim to be supplied by a gas company, and the conditions which the company may impose upon the applicant for a supply, it is necessary to consider the remedies possessed by the company against persons obtaining gas illegally, and also against persons who fraudulently manipulate a supply obtained by legal means.

Every person laying, or causing to be laid, any pipe to communicate with any pipe belonging to the company without their consent, is liable (whether such act be with or without fraudulent intent) to forfeit to the company the sum of £5 for every such offence, and also £2 for every day that such pipe may remain (G.C. 1847, s. 18), and may be prosecuted for stealing any gas so obtained (*Reg. v. White* [1853] 22 L.J.M.C., 123).

Every person who wilfully, fraudulently, or by culpable negligence, (*a*) alters the index to any meter; (*b*) prevents any meter from duly registering the quantity of gas supplied; or, (*c*) fraudulently abstracts, consumes, or uses a company's gas, shall (without prejudice to any other right or remedy for the protection of the company or the punishment of the offender), for every such offence, forfeit to the company a sum not exceeding £5; and the company may also—notwithstanding any contract with the person offending—discontinue the supply of gas until the matter complained of is remedied, but no longer. The existence of artificial means for causing such alteration, prevention, or abstraction, when the meter is under the custody or control of the consumer, shall be *primâ facie* evidence of wilful fraud by the consumer using such meter. (G.C. 1847, s. 18; G.C. 1871, s. 38.)

Any consumer connecting any meter with, or disconnecting any meter from, any pipe through which gas is supplied by the company to that meter, without giving the company at least twenty-four hours' notice in writing, is liable for each offence to a penalty not exceeding £2. (G.C. 1871, s. 15.)

Any person who knowingly repairs or alters, or causes to be repaired or altered, or tampers with, or in any way affects a stamped meter so as to cause it to register unjustly or fraudulently, may be fined a sum not exceeding £5, and must pay the cost of removing and testing such meter, and of supplying and fixing a new one; and the payment of such penalty does not exempt the offender from liability to indictment or other proceeding at law, nor deprive any person of the right to recover damages for any loss or injury sustained by such act. (S.G. 1859, s. 15.)

Where the gas supplied is not measured by meter, any person or corporation using any burner other than such as has been provided or approved by the company, or of larger dimensions than he has contracted to pay for, or keeping lights burning for a longer time than that contracted for, or otherwise improperly using or burning the gas, or supplying any other person with any part of the gas supplied by the company, is liable to forfeit to the company £5 for every such offence, and £5 for every day of its continuance; and the company may cut off the gas, notwithstanding any existing contract. (G.C. 1847, s. 18.)

(*To be continued.*)

THE PROSPECTS OF THE GAS OIL TRADE.

The subject of the quantity of petroleum distillates available for the present and future supply of gas-works in the United Kingdom having carburetted water-gas plant, including the considerations of the reliability of the supply, and the price of the oil, is actually exercising the minds of many British gas managers. It is only necessary to refer in passing, in this connection, to the point that has been put upon this question by recent and still pending parliamentary and journalistic discussions. We do not propose on this occasion to go into the merits of this controversy; but merely to offer a statement based upon the best and latest information relating to the petroleum fields from which gas oils are, or may be, drawn. It is understood that for the time being gas oil is cheap—cheaper, so some say, than coal for making gas in bulk up to 16-candle power. It is asserted to be forthcoming in any quantity desired; and contracts are being entered into for supplies at ruling prices for three years ahead. In these circumstances, it is proper to take a look round and see how the oil lands lie, generally. It cannot be forgotten that not very many months ago the oil market was against buyers. It would be waste of time to inquire now how far this condition was natural, and how far it was artificial. It had its effects upon the judgment of gas engineers in respect of the advantages of carburetted water-gas; but the most unfavourable of these appears to be yielding to the altered circumstances of the time.

For reasons which will be sufficiently obvious to those in the trade, the portion of the American supply for which the Standard Oil Company are responsible can be left out of any survey of the whole field. This is a large omission; but, as a matter of fact, the syndicated American oil supply is a constant factor which is not negligible, indeed, but it may well be reserved. The variable and discussable quantities are the supplies from other sources, of which the chief is the Russian. Anterior to 1901, the Russian mineral oil industry was in the enjoyment of high prices; but during that year a very marked decline in prices took place, and created a crisis in the trade of the places of origin which sorely tried both producers and refiners. The story of this state of affairs is told in the report of Mr. Stevens, His Majesty's Consul at Batoum, which has just been issued by the Foreign Office ("Report No. 2782. Russia"). The collapse of values is attributable, in the Consul's opinion, to over-production, which naturally resulted in the excessive accumulation of petroleum products at the sources of supply of the oil and the points of its shipment and export. It has been said also that the trouble was partly due to the insufficiency of the transport provided by the Trans-Caucasian Railway; but the Consul denies this, asserting that there were always heavy stocks of oil at the port of Batoum throughout the year. This being so, it is clear that the railway was not to blame for what happened, besides which the pipe-line between Mihailova and Batoum did not at any time during the year work up to its full capacity.

The high economic importance of this information, vouched for as it is by His Majesty's Consul, is obvious. There was all the year more oil at the port of lading than could find a market; and if more had been saleable, it was to have been had by the available means of inland transport. We are especially anxious to make it clear to readers of the "Journal" that this, and the following statements relating to the Batoum oil trade, are contained in the Consul's report, and rest on his authority, inasmuch as a totally unwarrantable "conveyance" of the whole information has been made by a periodical published in Manchester, and put forward in the form of an editorial article. Mr. Stevens goes on to state that he is the more convinced that excessive production was the true reason for the depression of the Russian mineral oil industry, seeing that, so far as his information goes, during the whole of the period under review the petroleum trade of the United States of America, "where there was no over-production," does not appear to have suffered in the least. In the United States, prices were maintained throughout the year; and in several instances both crude and illuminating oils were sold at almost double the figures that were being paid in the Caucasus for the same kind of oils. This

observation, of course, applies to the Pennsylvanian trade, and the supply controlled by the Standard Oil Company, who know how to sell and when to keep oil.

The over-production of Russian oil was principally brought about by the action of the Government, which opened up a vast extent of new oil-bearing territory under the impulse of the high prices of crude oil in 1898-1900. Leases were taken eagerly; competitors for the lands binding themselves to pay the Government as much as 1½d. and 1¾d. per 36 lbs. of crude oil obtained, in addition to all their expenses. As things now stand, the value of crude oil at the wells is only 1d. or 1¼d. per 36 lbs.; so that a fairly accurate idea can be formed of the heavy losses that are being sustained by those producers who do not reduce their production. The Consul is informed, however, that many of them have found it more profitable to cease work completely. The troubles of the new lessees, which are not at all the same as those of the old-established firms, are narrated by the Consul; but they do not concern us. Our only interest in the matter is with regard to the question of how the future of the trade is likely to stand affected. It appears that the existing means of transport are competent to forward 310 tank cars of petroleum per day on the railway; and also to pump 88,710 tons of kerosene per month through the portion of pipe-line already completed, between the station at Mihailova and the port of Batoum. This pipe-line is to be completed from the refineries round Baku; so that by the end of 1903 all the kerosene will be piped. Meanwhile, the railway itself is to be doubled, which will increase its carriage capacity to about 2½ million tons of oil per annum. How much of these facilities will be available for the transport of gas oil is not distinguished in the report.

Referring to the oil industry of Grozny, it is remarked that this crude oil differs from that of Baku in containing a very large proportion of benzine, with little kerosene. The residues of benzine distillation are called "ligroine," which cannot for the present be exported, owing to the heavy excise duty. The technic of Grozny oil distillation is still unsettled. The products are shipped from Novorossisk, a port which has been steadily drawing the oil export trade from Batoum, until now it amounts to 20 per cent. of the total. It is remarked, however, that this expansion at the expense of Batoum must cease with the completion of the pipe-line already mentioned, because transport by rail cannot compete with a pipe-line. This observation must apply solely to kerosene; for it is not proposed to pipe residuum. This is a notable point, for the exportation of residues (which means gas oils) to the United Kingdom from Batoum was 376,788 barrels in 1900, and 335,023 barrels in 1901. This was not quite one-third of the quantity of kerosene exported to England for the same years. All the residues must have gone first by rail; and it is reported from another source that the cost of railway transport to that of pipe-line conveyance is as 3·9 is to 1·2 (copecks per pood). Thus the less valuable product costs the most for land carriage. After all, however, this is not much—less than 1d. per 36 lbs. British.

Writing direct from Baku, Mr. Forbes, the Vice-Consul there, reports that the present crisis in the oil trade is the most severe on record. To understand the situation, it is necessary to revert to the time of the inflated and artificial prices of eighteen months ago. Then everybody went into the business of producing oil, with the result that prices fell, until now the depreciation of the shares in the companies involved is fully 50 per cent. Out of a total of 2400 producing wells, 1047 had, at the end of December, been stopped as being unprofitable to work. Yet "the supply of oil is, commercially speaking, inexhaustible;" but the industry is badly managed. "The production of crude oil seems to be limitless; and all that is required to double the present large production is a sufficient stimulant." The local demand for burning oil is restricted, and not likely to increase quickly. Steps are therefore being taken, as already narrated, to develop more fully the export trade in kerosene. "Apart from this possibility, the only redeeming feature of the situation is the increased demand for residuals. With present low prices, it should displace coal as fuel throughout the greater part of Russia, and thus withdraw the surplus production. . . . Moreover, a certain uneasiness has been felt by users of fuel oil as to the chances of that remaining cheap. During the boom, many who had previously converted their furnaces to the use of oil as fuel, finding that coal was cheaper, changed back to that product; and it may require very special inducements to return to oil, as the cost of converting and reconverting furnaces is not inconsiderable. If the demand for fuel oil does increase, it may save the situation, and so steady prices to enable the majority of the companies to work at a profit. From about 23s. per ton in 1900, the price of oil has gradually fallen, till it can to-day be purchased at (say) 5s. per ton." It is regarded as improbable that prices will for a long time to come rise to a level that will enable oil properties leased from the Government at a high figure to be a commercial success. "The production from freehold and leasehold plots held on low royalties is likely to continue large, and can be increased at will." If prices were to show an improvement, it could only be temporarily, because the moment the value of oil touches 10s. per ton, the holders of the leased lands will be able to recommence work, and the field is so productive that as a result the market would be flooded, and prices would recede to the previous low level.

A proposition is under consideration by the Government for allowing part of the royalty on oil produced from leased lands to be paid in kind. If this is permitted, the production will be enormously increased, prices will fall, and the last state of things will be worse than the first. Yet, in spite of the general depression, several companies with British capital are being formed for further developing the oil business; and it is Mr. Forbes's opinion that, if floated on a reasonable basis, they ought to prove successful, even at the ruling prices, because good oil properties can be had very cheap. Of course, it all depends upon what it would cost to put Russian "solar" distillate into gas companies' store tanks in England, with the crude material worth no more than from 5s. to 10s. per ton at the well. But in any case, the evidence we have given stands to show what are the prospects of the "solar" oil trade for the ensuing three years or so. Afterwards, the improved inland transport facilities will have their inevitable effect.

There is another aspect of the question, which is as to how the Borneo and Texas supplies, of which so much is heard occasionally, will stand affected by the fact of there being a limitless flow of oil in Russia only awaiting a favourable market. Borneo is a long way off; and there is a good deal of "wild cat" about the Texas business. The City Editor of the "Pall Mall Gazette" was rude enough the other day to remark that there are not many fools in England who have put money into Texas oil. Let us put the matter more politely, and say that nobody here grudges the Texans their splendid prospects. All these considerations go to indicate that the late snap-rise in the price of gas oil is not likely to be repeated in a hurry. Yet, nevertheless, who can say what might or might not happen, should gas coal again mount upwards? The resources of the Russian petroleum field will not be absolutely at the command of the consumers of fuel or gas oil in Europe until better means of transporting them to the seaboard are provided; and of this there is no present sign, as regards any other product besides kerosene. In this reflection, the Texan speculators will find their best solace.

FROM OLD CONDITIONS TO NEW AT THE WALSALL GAS-WORKS.

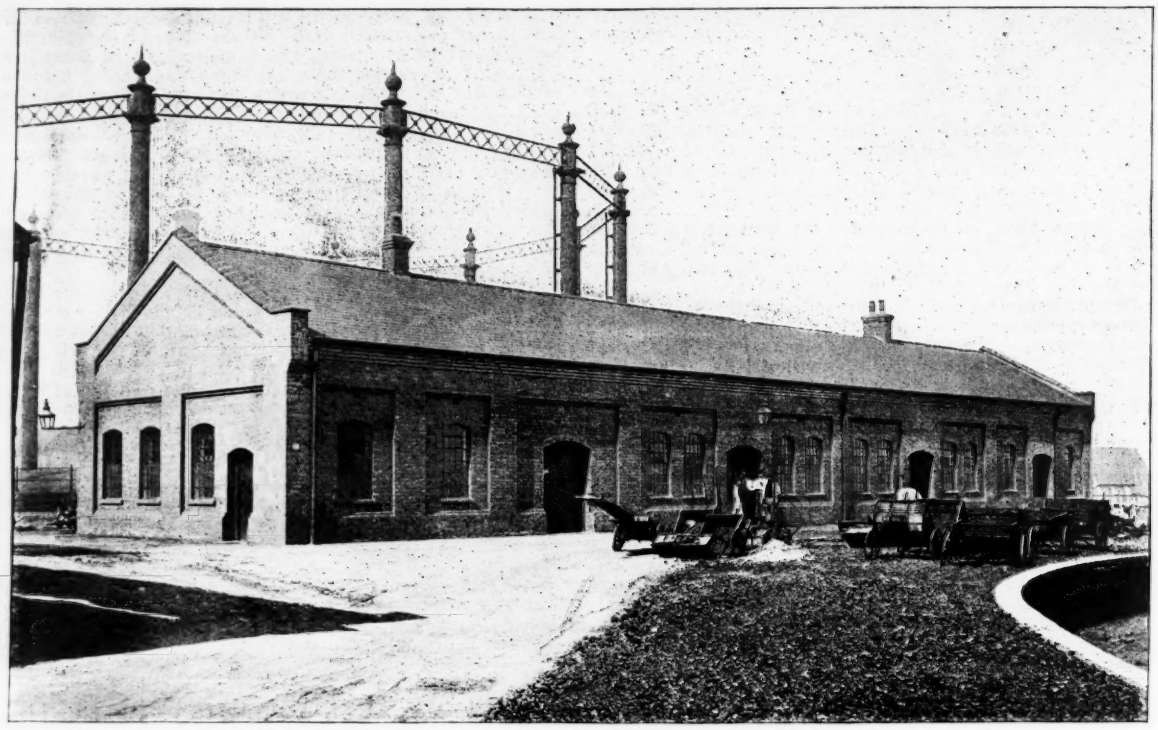
(*Concluded from p.* 1412.)

New Miscellaneous Plant and Shopping.

It will have been seen by the reader who has followed the previous articles that, in the conversion of the Walsall Gas-Works, the Engineer (Mr. B. W. Smith) has so far done two main things. He has given to No. 1 retort-house a producing capacity of about 2 million cubic feet per day, in comparison with its former yield of half that quantity; and he has made No. 1 purifier-house competent to deal with 2¼ million cubic feet of gas, instead of 1 million. No. 2 retort-house (which was built for a 2 million cubic feet make) has purifying plant only rated at a capacity of 1 million cubic feet. The increases in these two directions—in producing and purifying power—have had their effect on other portions of the plant, and have compelled (added to the previous inherent disability of certain sections) complete reorganization and additional provision. Our object now is to group the miscellaneous contributions to the scheme in this final article.

The odd work being of a miscellaneous character, we cannot deal with it in its proper succession in the manufacturing operations. As, however, in last week's article, the new purifying plant was described, we may now make up the connection in the other branches of purification. It has already been mentioned that Mr. Smith's idea is to raise the works throughout to a productive level of 4 million cubic feet per day; and, with this object in view, he has pulled out two tower washers, which were filled with boards, and has put in their stead a 2 million Livesey washer, and a 1½ million Holmes washer. Coming to the condensers, it is found that a new Morris and Cutler condenser, equal to 1½ million cubic feet, has been installed; and as the old condensers were supposed to be equal to a million cubic feet, there is now a condensing area of 2½ million cubic feet on No. 1 section of the works. At the present time, water from the adjacent canal is being used for condensing purposes; and it is through this water being so warm in the summer that a greater condensing area is required than might otherwise be really necessary, and also because the Canal Company have since declined to allow a further supply to be taken. In this connection, while wandering through the works, it was noticed that Messrs. Isler and Co.'s men are sinking a well for a water supply; but it was too early then to speak as to the amount of success that will reward this venture.

On entering the exhauster-house, the first thing which attracts the eye is the alteration which has been made to the engines of No. 1 section. The exhausters originally were driven from engines by means of belting. In making the change, in one case it meant the turning round of the exhauster and coupling it direct to the engine; and, as the engine was a left-handed one, the latter has had to be worked in the opposite direction. A new 100,000 feet per hour exhauster of Bryan Donkin and Clench's make was attached in a like manner to the other engine. By this piece of engineering, two good engines were utilized. Without going into the matter minutely, it is impossible to describe exactly what formerly existed in the exhauster-house, the reason for the change and the present condition of the equipment of the house; and as probably the same set of circumstances does not exist elsewhere, nothing will be lost by not entering into the matter at length. One



THE NEW SHOPS, MESS ROOM, LAVATORY, &c.

point, however, may be mentioned, which shows a difference between Mr. Smith's practice and that of many other gas engineers. He prefers to control his engines by the ebb and flow of the gas from the source where it is made, as opposed to the common practice of control from the inlet of the exhauster or, as he puts it, "probably still worse," from the outlet of the condenser. In other words, he prefers to connect up direct with the retort-house, and so obtain the immediate influence of any variations in the retorts.

The meter-house has been enlarged and improved in various ways. Formerly, it contained two meters, each of 50,000 cubic feet per hour capacity, or (say) a million cubic feet per day. These meters have now been allocated to No. 1 section of the works; and in the extended part of the meter-house, there is a fine new meter for the output of the second section and for that of future gas-producing extensions. This meter was made by Parkinson and W. & B. Cowan; and it equals in capacity both the other meters together—that is to say, 100,000 cubic feet per hour. The total meter power is now, therefore, 200,000 cubic feet an hour. The meters all have 20-inch connections.

Looking into the governor-house, it is found that a new 24-inch Cowan governor has entered into companionship with two Braddock 20-inch ones; the foundations for the new one having been prepared before Mr. Smith took charge of the works. At the old station at Wolverhampton Street (where manufacturing work ceased some time since), there are three other governors.

Close by the governor-house, there is a little, newly constructed building, containing an exhauster and gas-engine, which are used for temporarily tiding over a difficulty in the supply to a portion of the town at present supplied from the old works. When gas making was discontinued at Wolverhampton Street, the mains from the Pleck works were partially altered to take up the larger supply. The consequence was the consumption of gas increased, and there were no means of adequately or safely feeding the portion of the town in the winter. All there was to rely upon was a 10-inch high-pressure main to fill the holders at the old works; and, in fact, through this main something like one-and-a-half times more gas was being sent than it was intended to carry. The temporary expedient adopted by Mr. Smith to overcome the difficulty was to transfer an old 50,000 cubic feet exhauster from the engine-house to this little building, and connect to it a 6-horse power "Stockport" gas-engine. By these means, he is able, by pumping from the Pleck works, to get 34,000 cubic feet of gas per hour into the holders at Wolverhampton Street; and in this way he can keep the district going.

Among sundry other work, it was noticed that a house is now being constructed to take a "Waller" coke plant for screening and breaking the coke into three different sizes.

In gas-works of complete pretensions, the workshops and the comfort of the workmen are happily receiving more and more attention. In his scheme, Mr. Smith has made splendid provision in both these respects. The reproduction of a photograph which we publish this week shows a fine range of buildings, comprising stokers' mess-room, lavatory, bath-room, iron-stores, and blacksmiths', fitters', and carpenters' shops. Very strong and plain construction is a feature of these buildings. The whole of the shops and mess-room are well lighted and ventilated, and heated where necessary. The dimensions of the range are: 142 ft. 8 in. long by 33 ft. wide, and 25 ft. 3 in. high to the ridge of the roof.

Looking at the shops and the conveniences provided from the point of view first of the men, it must, the writer has no hesitation in saying, be admitted by them that everything has been done for their personal comfort. The mess-room, the lavatory, and the bath-room are in a block at one end of the buildings; and they are all fitted in manner and style that cannot fail to give pleasure to the men. In the mess-room, there is a large grate, with a boiler at the back for the supply of hot water to a 60-gallon tank. (The place is also provided with a cold-water tank of a capacity of 100 gallons.) For cooking and warming food, the range is supplied with a large and small oven—one on each side. In the lavatory are six oval-shaped plug basins, fitted with supplies of hot and cold water; and in the bath-room is a 5 ft. 6 in. bath, also supplied with hot and cold water. In the fitters' and carpenters' shops are also grates, with ovens. Such consideration for the men as is shown here in all these up-to-date appliances for ensuring to them some of the common blessings of life during their working part of the day, is not accorded in all gas-works; and, going from works to works, one soon gets convinced that attention such as is found at Walsall does much to soften the relationship between masters and men and to lighten the work of the day.

From the point of view of utility, the shops have already made themselves an indispensable part of the works, and will do so more and more. They are being equipped to fit them for all manner of repairs and small new work that may arise on the works or in the distribution system. Apart from the ordinary tools, in the blacksmith's shop a punching and shearing machine is being put in; the stores are found supplied with iron of many sections and weights; in the fitters' shop is seen a gas-engine, a vertical drilling-machine, and a 10-inch centre by a 12 foot gap bed lathe—all machinery of a character that a workman appreciates; and, lastly, in the carpenters' shop is a good circular saw-bench, and many other things which go to add to the usefulness of the place. Mr. Smith has not yet completed the equipment of the shops; but it is his intention to have them so fitted that from them will proceed the best work that can be obtained in the various directions in which they will serve the undertaking.

The end of the notes has been reached from which has been prepared this descriptive account of the great and many changes that have been effected at the Walsall Gas-Works. The extent of the transformation that has been made has been shown; but the considerable mass of detail that it has involved has not been entered into in this series of articles. Engineering readers, experienced in the reformation and modernizing of old and out-of-date works, will, however, be able to give it adequate measure. With so many pressing requirements—varied and vast—a masterful engineering head was needed. The character of the finished work is the proof that what was wanted was obtained. There has, of course, been some considerable expenditure of capital. But one has no hesitation in saying that, from it, the undertaking, and through the undertaking the Corporation, will reap in due season

substantial benefit; and when the time is ripe for carrying forward the scheme into other parts of the works, valuable advantages are likewise sure to ensue.

We cannot conclude without remarking that, in the preparation of his numerous drawings, and in the execution of the various contracts, Mr. Smith was helped considerably by the interest taken in the improvement scheme by his assistant (Mr. Sidney T. Smith), the son of Mr. Thomas Smith, the late Secretary of the Cannock and Hednesford District Gas Company.

ELECTRIC LIGHTING MEMORANDA.

Edison's New Traction Battery—A Reported Success—The Cost of Working Electric Tramways—Mr. J. Allen Baker's Predictions Challenged.

THERE is much significance in the intelligence lately received from New York, that Mr. Edison is persevering with the practical development of his new invention of an electric storage battery. Since the consummation of the "deal" by which the Edison Lighting Company of New York were absorbed by the combination of capitalists which now rules the lighting and street railway services of the city, Mr. Edison seems to have given up the electric light, and concentrated his attention upon the hitherto unsolved problem of free electric traction on common roads. It is interesting to observe that this paragon of American inventive enterprise has never identified himself with the common type of electric tramcar, from which it is safe to infer that he does not think highly of it. Indeed, unless memory plays us false, Mr. Edison has on several occasions expressed the opinion that a system of road traction which is tied rigidly to rails at one extremity, and to a line conductor at the other, cannot claim to be the final realization of the possibilities of electric power in this connection. In common with many other competent judges, Mr. Edison has therefore adhered to the judgment that it is to the principle of electric storage in portable apparatus that the ultimate solution of the problem of mechanical road traction will be referable, whenever it comes. The accuracy of this forecast is not vitiated by the ill-success that has hitherto attended all endeavours to drive any other vehicles besides small river launches by means of storage batteries of the Faure type. These appliances are simply unsuitable for the purpose, by reason of their great weight and the injury they suffer when run down below a certain remainder charge.

Like the good worker he is, Mr. Edison has not withheld his hand from the endeavour to himself work out the solution of the problem as he sees it. He has for some time been experimenting with a storage battery in which iron and nickel take the place of the lead in the older accumulators; and it is now reported that substantial success has rewarded his efforts. According to a "Standard" telegram from New York, dated the 29th ult., the new Edison battery is composed of extremely small bricks of iron and nickel enclosed in a sealed steel case, which measures 12 inches high and is 6 in. long by 4 in. wide. In the process of charging and discharging, a "potash solution drives the oxygen from one metal to the other without corrosion, the occasional renewal of the water being a sufficient preservation." The account leaves something to be desired in respect to its clearness; but it must serve for want of a better. The inventor is further reported to have said that the battery could be charged for 20 miles in forty minutes. This, again, does not convey very much. More to the point is the information that Mr. Edison has been experimenting so far with a light motor-car, carrying from two to four persons, and driven by a battery of twenty-one cells, weighing 332 lbs. If a battery of this weight is capable of driving such a car, loaded, for 20 miles, then it is quite evident that the problem of electric road transport is solved. For the first time in the history of the art, an electric motor appliance has beaten the horse, weight for weight. The news seems almost too good to be true.

Meanwhile, from the accounts of corporation electric tramway undertakings that are slowly filtering through the columns of our electrical contemporaries, it does not appear that the economy of their method of traction is much to boast of; it does not realize the confident predictions of its partisans. One of the largest undertakings of the kind is that of the Liverpool Corporation, which is distinguished by having the advantage of an arrangement whereby the motor current is supplied by the Electric Power and Lighting Committee at an inclusive charge of 1·2d. per unit. This must be under cost price; but inasmuch as the users of the Corporation electric light, or the ratepayers, must bear the difference, the matter is a purely domestic one. What is generally interesting is the disclosure that even under this exceptionally favourable condition the total costs of working the Liverpool tramways electrically were over 7d. per car-mile. The precise figure is 7·166d. The charge for power and lighting alone was 1·612d. per electric car-mile. These figures are from the "Electrician." Now, if readers of the "JOURNAL" will carry their minds back to the second half of the year 1898, they will recall the discussions that went on in our pages at that period upon the prospects of electric tramcar working, and the possibilities of the gas-power car. At that time also, Mr. J. Allen Baker, a prominent member of the London County Council, was very actively pressing on the project, now in course of realization, of the conversion to electric power of the tramways belonging to the County Council. He wrote a very fair report on the subject, for an amateur, which was published at the expense of the Council as a public document. It was the gist of this statement that, seeing that electric traction might be expected to cost no more than 5d. per car-mile, as against 10d. per car-mile of which the existing London Tramway Companies accused themselves, the policy he favoured would procure all manner of benefits and blessings for the ratepayers.

All these matters will be found in a series of "JOURNAL" articles, the last of which summed up Mr. Baker's case on page 1348 of our issue of December 13, 1898. The truth of the affair is now seen to be that, instead of working at a total cost of 5d. per electric car-mile, it costs Liverpool 7·166d. per car-mile with electricity delivered at the absurd price of 1·2d. per unit. The Birmingham Corporation are in the same case. They do not do quite so much electric tramway work; but they have been diligently seeking for the cheapest out of several systems, and the cost of working has been 11·66d. per car-mile. How is this for the economy of electric tramway working? It is not that the Birmingham undertaking, which is admittedly in a transition stage, must necessarily be taken as a fair example of what can be done in this way. But what about Liverpool? What is the matter there that the Corporation experience should not be taken as representative? Of course, if this point is conceded, it means that whatever other advantages electric tramway working may possess, economy of working, as compared with the old system, is not among them. In other words, electric power, which cannot beat steam on main lines of railway, cannot beat horses on town tramways, from the point of view of remunerative working.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 1509.)

THE feeling that amounted almost to conviction, that a South African peace was close at hand, was the one dominant factor in the Stock Exchange last week. Every market was firm and buoyant; and prices all round showed a nice rise. The advance had a slight check in mid-week, owing to a disposition here and there to realize profits; but the closing figures went higher again. Consols and gilt-edged investments were in good demand; and some new issues were largely over-subscribed. The official announcement of peace has now been made, and therefore further advances in price may be looked for. In the Money Market, there was a brisk demand in relation to the Stock Exchange fortnightly settlement and other periodical requirements; but, at the close, the tendency was in favour of greater ease. Business in the Gas Market fell to very small proportions indeed, less even than the preceding week. Hardly any issues were touched, except those of the two leading Companies; and even in these there did not appear to be much animation. Changes in quotations were very few and slight, and were rather capricious; and it cannot be said that there was any general tendency, except of a negative character. In Gaslight issues, the ordinary was quietly and sparingly dealt in daily at very steady figures, and always within the limits of 93¾ and 94¼; but there was no sign of anything like an improvement on these. The secured issues were steady and firm; and the quotation of the debenture stock advanced a point. South Metropolitan was not much dealt in, and was weak. After changing hands on the opening day at 121, it dropped on Saturday to a mark of 118½; but the quotation was left standing. The recent issue of new capital has no doubt had something to do with the restricted inquiry for stock in the market. In Commercials, a parcel of the old stock was let go at a low figure, and the quotation went down with it; but the next bargain was done at top price. The Suburban and Provincial group were hardly touched in the London market; but, in the local Exchange, Newcastle debenture advanced. The Continental Companies were extremely inactive, and there was no feature observable beyond the continued weakness of Union—both issues being marked down *ex div.* There was no incident in connection with any of the remoter undertakings. Business in the Water Companies was of its usual quiet character; and there was no movement whatever in prices. The slow progress of the Water Bill is watched with attention, and its doubtful issue awaited.

The daily operations were so small and unimportant that they do not call for any more detailed notice. On Monday, Commercial old fell 3, and on Tuesday Gaslight debenture rose 1. On Wednesday, a few issues were marked *ex div.*; and no further changes occurred during the remainder of the week.

Protecting the Sources of Water Supply.—At a meeting of the Executive Council of the County Councils Association held last Wednesday, under the presidency of Sir J. T. Hibbert, the memorandum drawn up by the Committee on the Sources of Water Supply was considered, and, after discussion, adopted. It suggested that an inquiry should be held, either by Royal Commission or Select Committee, into the existing state of the law governing the protection of sources of water supply, the pollution of rivers, and other kindred subjects. The Committee were instructed to take steps to bring the matter before the Government.

INCORPORATED GAS INSTITUTE.

The Programme for the Forthcoming Annual Meeting.

In the "Journal" for the 13th ult., we gave an indication of the nature of the proceedings at the forthcoming annual meeting of the Gas Institute, which, as our readers are aware, will be held at Southampton next Tuesday and the two following days, under the presidency of Mr. S. Westall Durkin, Engineer and Manager of the Southampton Gas Company. We are now able, from the programme of the proceedings, which has been issued by the Secretary (Mr. Walter T. Dunn) to give fuller particulars in regard to the nature of the technical portion of the business.

As previously mentioned, the Institute will receive a welcome from the Mayor of Southampton (Mr. F. A. Dunsford, J.P.) on behalf of the town; and the Chairman (Dr. T. W. Trend, J.P.) and Directors of the Company with which the President has been for so many years associated will greet them not less heartily as representing the industry with which the Institute is identified. The business of the meeting will be transacted in the Royal Victoria Rooms; and it will be opened with the usual routine matters, which include the presentation of the annual report and accounts and the premiums for the best of last year's papers. The Council announce a total membership at the close of the year of 688, distributed as follows: Honorary members, 18; ordinary members, 523; extraordinary members, 30; associate members, 66; and associates, 51—an increase of 5 on the previous total. The Institute lost 15 members by death during the year; among them being two who had taken a conspicuous part in the proceedings of the organization—Mr. William Carr and Mr. Charles Sellers—the former of whom was on the Council at the time of his death. The death of Mr. Peter Simpson, of Rugby, caused a vacancy in the trusteeship which has been filled by the appointment of Mr. James Stelfox, of Belfast. Two vacancies occurred on the Council during the year, due to the election of Mr. T. H. Martin, of Barnet, as Vice-President, and to the death of Mr. Carr. These have been filled by the election of Mr. Matt. Dunn, of Goole, and Mr. Octavius Thomas, of Rhondda. With regard to the financial position of the Institute, a sum of £15 had to be taken from the profit and loss account, to balance the revenue account, reducing the total of the former from £1595 to £1580; but the investments were raised last year from £668 to £998. Reference is made to the proceedings at last year's meeting, and the award of the following premiums is announced: First (£10 and the President's silver medals) to Mr. Walter Grafton, for his paper on "The Effect of Quality and Pressure on the Efficiency of Incandescent Gas Lighting, having regard to Economy;" the second (£6) to Mr. Robert Porter, for his paper on "British Water Gas Practice;" and the third (£4) to Mr. W. Sugg, for his paper on "High and Low Pressure Incandescent Gas Lighting." The Council next summarize the proceedings, so far as they have gone, on the amalgamation question, and give the text of the two resolutions on the subject passed at the recent meeting of the Institution of Gas Engineers, which will be submitted to the members early on the first day of the meeting. The settlement of the long-discussed question of the standardization of meter-unions is alluded to by the Council, and Mr. Chaney's communication on the matter, which has been noticed in our columns, is reproduced. The visit to London of the members of the Société Technique and the holding of the International Engineering Congress in Glasgow are noticed. The report closes with an acknowledgment of some useful donations to the library (a list of which is given), including a framed portrait of the late Mr. Thomas Hawksley—the first President of the British Association of Gas Managers—presented by his son, Mr. Charles Hawksley, the President this year of the Institution of Civil Engineers.

The preliminaries having been disposed of, Mr. Durkin will deliver his Inaugural Address; and then the reading of papers will be commenced. The following is the list:—

> "The Steam Turbine as a Motor for Blowing and Exhausting Apparatus," by Mr. W. D. Child, of Romford; "Large Gas-Engines and the Gases used by them," by Mr. Dugald Clerk, of London; "Efficiency and Economy in Gas Distribution," by Mr. Walter Hole, of Leeds; "The Maintenance of Incandescent Gas Burners by Gas Companies," by Mr. Norton H. Humphrys, of Salisbury; "Is the Gas Capital in England and Wales Excessive?" by Mr. C. E. Jones, of London; "The Valuation of Gas Oils," by Mr. John P. Leather, of Burnley; "A New System of Gas Measurement," by Mr. T. G. Marsh, of Manchester; "The Automatic Lighting and Extinguishing of Public Lamps," by Mr. W. R. Mealing, of London; "Sunday Rest for Gas Workers," by Mr. R. G. Shadbolt, of Grantham; "The Fittings Business as an Aid in the Sale of Gas," by Mr. Robert Watson, of Hertford.

In addition to the papers, Mr. James Swinburne, M.Inst.C.E., will deliver a Lecture, on Wednesday morning, on "Electric Traction and Electrolysis." At the close of the business on Tuesday morning, the members will be invited to luncheon at the Philharmonic Rooms by the Chairman and Directors of the Gas Company; and afterwards Mr. W. Dale, F.S.A., will give a short description of historic pictures of Old Southampton collected by W. Burrough Hill, Esq., and conduct members and ladies accompanying them to view some of the features of antiquarian interest in the town.

The proceedings on Wednesday morning, as mentioned above, will open with the lecture; and this will be followed by the reading and discussion of papers, which will not be continued in the afternoon, unless found to be necessary. The annual meeting of the subscribers to the Benevolent Fund will, however, be held. The Committee, in their report, express regret at the falling off in the receipts last year, compared with 1900; and they again earnestly invite members of the Institute who are not already subscribers to allow their names to be added to the list. With upwards of the 680 names on the roll, the donors and subscribers to the fund number only 93. This is certainly a striking disproportion which should not exist. The receipts in the past year amounted to £168 7s. 4d.; the expenditure to £117 3s. 8d., of which £100 was disbursed in affording assistance in various cases duly investigated by the Committee. Later in the afternoon, the members will have an opportunity, by permission of Colonel D. A. Johnston, R.E., Director-General of the Ordnance Survey Department, of visiting the Ordnance Survey Office, where all the processes for the production of the Ordnance Survey maps will be shown in operation. The Southampton Gas-Works will be open for visitors during the week.

On Thursday, the rest of the papers will be taken, and the remainder of the business disposed of. In the evening, the President and Mrs. Durkin will hold a *conversazione* at the Royal Victoria Rooms. Friday will be devoted to an excursion to the Isle of Wight, with luncheon at the historical Carisbrooke Castle, and a drive to Shanklin. The island ought by that time to be in her brightest attire, and therefore the trips should form a refreshing termination to a meeting which promises, from the number of technical items on the programme, to be a particularly busy and interesting one.

SOCIÉTÉ TECHNIQUE DE L'INDUSTRIE DU GAZ.

Programme and Papers for the Annual Meeting.

Following the rule of the Société Technique du Gaz, that every second year their annual meeting should be held in the French capital, the forthcoming congress will take place in Paris. It will be opened a fortnight to-day, the 17th inst., and will last for the usual three days. The Salle Charras will once again be the place of meeting; and the proceedings will be opened in the ordinary way by the transaction of preliminary business, the election of new members, the reading of the official reports, and the nomination of members to serve on the Committee.

The presidential address of M. Maurice Piaton will be the first item of the afternoon's programme, after which the prizes for the best papers read last year at Dieppe will be presented, as well as the awards to the most deserving of gas-works foremen and workmen. Then will follow the reading and discussion of the technical papers offered. These number in all 29; one author—M. Lecomte—presenting no less than three papers, while five other gentlemen are responsible for two each. There are two papers, or reports, down in the name of the Secretary of the Committee; one dealing with a similar subject to that which our own Institutions have given attention to—viz., the standardization of the screw-threads of consumers' gas apparatus. The other report consists of an analysis of the work done by the Technical Committee appointed in Paris to inquire into the administration of its gas affairs after 1905—that is, of course, on the expiration of the Paris Gas Company's concession.

On glancing through the list of other papers to be read, it must reluctantly be confessed that they hardly hold out great promise of attraction, though we sincerely hope that the contents of the papers themselves will prove this first impression to be unwarranted. There does not appear to be any communication of exceptional importance or of supreme interest. Constructiona or mechanical work is represented by a paper by M. Godinet, de scribing six arches of inclined retorts that have been put up at the Lyon-Vaise Gas-Works; the same author having also a note on a cable-guided gasholder erected at the southern and old Roman town of Rodez. The mechanical handling (if such an oxymoron may be used) of coal is to be treated by M. Laurain, who, it may be remembered, read a paper on the same subject last year; and M. Dulac will describe a balanced charging-machine, and remark on the scurfing of retorts. M. Rouget writes on experiments on the saturation of gas by wet meters. M. Lacaze also deals with meters, and, in a second paper, with an indicator for the flow from gas-mains. One of M. Lecomte's three papers inquires into the subject of heating by gas; another, into competitive means of lighting (carburetted air, petroleum, and alcohol); and the third is descriptive of two plants for enriching gas by benzol. In the department of bye-products, means of using coke are commented upon by MM. Lencachez and Frère; and M. Guillet has two papers on the extraction of cyanides from gas, and on the ammonia retained by tar. M. Riollé describes an apparatus using a volatile liquid for the absorption of naphthalene from gas-mains; and M. Bouvier, a compressing fan for gas delivery. Other papers refer to gas lighting. M. Bandsept brings to notice a new combination of incandescent burners; M. Goiffon describes the system of lighting used at the great Creusot works; MM. F. & C. Pierson give an account of the electric light station of the Tunis Gas-Works; and M. Badon-Pascal records a means for the lighting of public lamps. With M. Bachelay's characteristic "Three Words

Only" on deep pumping, lamp lighting, and standardization of threads and bricks, we can close this summary of the list of papers to be read, with the hope that we shall be able to record in due course a very satisfactory meeting of the Société Technique du Gaz en France.

PERSONAL.

Mr. G. Curtis, of the Cambridge Gas Company, has been appointed Assistant to the Superintendent of the Mains Department of the Leeds Corporation, at a salary of £130 per annum.

The friends of Mr. and Mrs. B. W. Smith, of Walsall, will regret to hear that they have had information from the War Office that their son, who recently went out to South Africa as an Electrical Volunteer attached to the Royal Engineers, is dangerously ill with enteric fever. We trust that consoling news will be quickly received.

We hasten to add our congratulations to those doubtless already received by him from many friends, to Mr. J. Arnold Norcross, on his marriage to Cellissa, the daughter of Mr. and Mrs. S. Orman Brown, of Dover (Maine), U.S.A. The wedding was solemnized last Tuesday, at the Foxcroft and Dover Congregational Church. We wish Mr. and Mrs. Norcross long life and every happiness.

OBITUARY.

Funeral of the late Mr. W. R. Chester.

As we intimated would be the case, the funeral of the late Mr. W. R. Chester took place at the Church Cemetery, Mansfield Road, Nottingham, on Wednesday afternoon of last week. Besides the family and a large number of personal friends of the deceased gentleman, the Corporation were represented by his Worship the Mayor (Mr. E. N. Elborne, J.P.), the Sheriff (Mr. E. G. Loverseed), and the Deputy Town Clerk (Mr. J. H. Richards). Alderman J. P. Ford, J.P., and Mr. J. Barber, J.P., the present and late Chairmen of the Gas Committee, also attended, as well as many of those with whom Mr. Chester was more intimately associated in his life's work of late years—including the Works Superintendents of the various stations of the Gas Department and Mr. W. Garton, the Gas Accountant. Mr. Arthur Graham (of Mansfield), the President of the Manchester District Institution of Gas Engineers, Mr. R. G. Shadbolt (of Grantham), the Secretary, and Mr. Robert Porter (of Elland), Past-President, specially represented that body. The first portion of the burial service, at which Canon Lewis officiated, was held at St. Andrew's Church; and the service at the grave was conducted by the Rev. A. Ping, late Curate-in-Charge of St. Jude's, Mapperley.

Mr. W. H. Fox, the Borough Engineer to the Corporation of Barrow, died on the 24th ult. at the age of 64. Mr. Fox, who was a native of Southampton, was appointed Borough Surveyor and Engineer of Barrow in 1879. He was associated with many improvement schemes in that rapidly growing town; but his great work, for which parliamentary sanction was obtained last year, is the unlimited water supply which the Corporation are now empowered to take from the River Duddon.

We regret to announce the death, on the 30th ult., at his residence, No. 14, Dean's Yard, Westminster, of Sir James Morse Carmichael, Bart., one of the Directors of the Imperial Continental Gas Association, having joined the Board in November, 1891. Sir James was the eldest son of the second baronet, Sir James Robert Carmichael, by his marriage with the daughter of Sir Thomas Butler, of Garryhundon, and grandson of Major-General Sir James Carmichael-Smyth, a distinguished Waterloo officer. He was educated at Radley, and for 18 years was a clerk at the Admiralty before succeeding to the title in 1883. Sir James was private secretary to Mr. Bright, Mr. Childers, and Mr. Gladstone successively; and he represented the St. Rollox Division of Glasgow in the Liberal interest in the House of Commons from 1892 to 1895. The deceased baronet was in his 58th year.

Mr. G. J. Gilchrist, the Convener of the Gas Committee of the Broughty Ferry Corporation, died suddenly on Saturday morning. He was one of the members of the Corporation who repaired to the gas-works on the discovery that a mistake had been made in the changing of a gasholder, as mentioned in our "Scotch Notes" to-day. He rushed off to the works imperfectly clad, and caught a chill. He took to bed on Friday, but was not considered to be so ill as to require medical aid. Early in the morning of Saturday, it was discovered that he had passed away in his sleep. Mr. Gilchrist has had arduous and very difficult work as Convener, in connection with gas-works extensions and the arrangements for the introduction by the Corporation of electric lighting. He may thus be said to have died in harness; and his demise is all the more regrettable in that it may be said to have resulted from devotion to duty, and to be directly traceable to the mistake of a workman.

The death is reported from New York of Dr. H. Morton, whose name is known to many of our readers as the President of the Stevens Institute of Technology at Hoboken, New Jersey; his contributions to scientific literature having been noticed from time to time in our columns. It was founded, under the will of Mr. Edwin A. Stevens, for providing higher instruction in technological subjects; and Dr. Morton was specially designated by the founder to take entire control over it. He was one of the most proficient of the engineering experts known to America; and he lavished his large income upon the Institute. In 1880, he made his first gift, which took the form of a new workshop fitted up with steam-engines and tools. Two years later, he gave money for the purchase of electrical apparatus. In 1888, he gave $10,000 for the endowment of a chair of engineering practice, to which, in 1892, he added $20,000 more. For many years he contributed to electrical experiments the whole of his salary as Professor of Applied Electricity. In all, his gifts to the Institute have amounted to about $145,000. A few years ago he interested Mr. Andrew Carnegie in the work, with the result that the latter gave a laboratory, and endowed it in addition with $100,000. Dr. Morton was elected an honorary member of the American Gaslight Association at the 1878 meeting of that body, and the Association are indebted to him for two lectures—one on "The Electric Light," delivered in the Stevens Institute on Oct. 17, 1878; the other on the occasion of the annual meeting held in New York on Oct. 19, 1899, his subject being "New or Recent Developments in Artificial Lighting." Deceased was in his 66th year.

By the death last Wednesday, in his 75th year, of Mr. Joseph Tangye, Bewdley has lost one of her most notable residents, and the great engineering firm of Birmingham the pioneer in its establishment. Fifty years ago, Mr. Tangye made his way from Cornwall, his birthplace, to the Warwickshire capital, and with a single lathe in an upstairs room laid the first stone of the edifice which is now so conspicuous an object in the town. In its erection, he was associated with his brothers, who have the gratification of knowing that their combined enterprise now gives employment to between 2000 and 3000 workpeople. The name of the firm has been constantly before the gas world—for some years in association with that of Mr. Stephen Holman, whose eccentric lever fastening for retort-lids is known to every gas engineer. It may be remembered that some time ago they manifested their interest in the gas industry by having a tablet placed upon Murdoch's house at Redruth and it is shown in one of the reproduced photographs on the pictorial Christmas card sent out by Mr. Charles Hunt, and given in the "Journal" for Dec. 31 last. Mr. Joseph Tangye left the business about 25 years ago, and lived first at the once Royal abode at Ticknell, which he had purchased, and afterwards at the residence which he built for himself, known as "Hern's Nest," where he passed away. He carried his engineering tastes with him into his retirement, and had a fitting-shop at his successive residences, where he spent much time in engineering work and often devised something new. He was formerly an Alderman of the Bewdley Corporation, a Justice of the Peace, and Chairman of the Gas Company. He took a considerable interest in the locality where the later years of his life were spent, and was ever ready to give others the benefit of his mechanical genius and advice. He leaves a widow and several sons and daughters. The funeral took place on Saturday, at Key Hill Cemetery, Birmingham.

Patents in the Past Year.—The report for the year 1901 of the Comptroller-General of Patents, Designs, and Trade Marks (Mr. C. N. Dalton, C.B.), which has just been issued as a parliamentary paper, and is noticed in our editorial columns, shows that the receipts from patent fees were £210,187, an increase of £6047 compared with 1900; from design fees, £3432, an increase of £338; and from trade mark fees, £10,506, a decrease of £493. The surplus of receipts over payments was £107,291. The number of applications for patents received in 1901 was 26,777, compared with 23,924 in 1900. The total number of specifications received was 34,399—an increase of 3187, or 10·2 per cent.

The "Keystone" Mantle.—Our attention has been called to a new mantle, which is to be distinguished by the name of the "Keystone." When we remember that the keystone is the crowning point of an arch, and that the arch depends largely for its strength upon the keystone, the appellation is certainly an ambitious one for a mantle. But the Company who are introducing it, and who are making it in large numbers at their offices in the City, tell us that they are confident they can justify the title from all points—particularly from that of strength. To prove this, a mantle was flattened, handled, and dropped without injury. It was then burnt off, stood unsupported on a desk, and afterwards struck sharply in a manner to which it would never be subjected in ordinary use. Instead of falling and crumbling into dust, it simply dropped to the ground and there broke in large flakes. Mantles were shown alight; and the illuminating power was good. Asking as to the solution in which the fabric was dipped, the information was given that the process is a secret one, but that the mantle contained a "metallic substance which prevented it breaking and crumbling into dust," without, of course, violent usage. It is certainly a clean looking mantle, and of very fine texture. Inquiring for photometrical tests, we were again told that the makers had not any at present, but that they were quite satisfied to leave the mantle in this respect to the judgment of users. The prices mentioned are low; and the makers say they are enabled to supply them at a cheap rate owing to the rapidity with which they can produce them by the aid of machines which can deal with a large number at a time. Many no doubt will be tempted to try these mantles in order to test the claims for themselves; and a trial the makers assert will fully vindicate their title to the ascribed merits.

NOTES.

The Harmet Gas and Electric Steel Process.

A tremendous combination of gas and electric furnaces is proposed in the Harmet process for the direct production of steel from the ore. The arrangement consists of two cupolas or producers of the blast furnace order in series with an electric open-hearth steel furnace. The ore is tipped into the first cupola, near the bottom of which it is semi-fused by the heat of the gases from the second producer, in conjunction with the heat of electrodes lying along its bottom. This semi-fluid metal is caused to pass down an incline to the coke-bed of the second cupola or producer, where it is melted and reduced. The molten metal flows out through a filter of coke, which keeps back the slag, into the hearth of the open-hearth steel furnace already mentioned, where it receives heat from electrodes. The calculation of energy required has been made, showing that in this combination about 50 per cent. more than the number of calories to be supplied electrically will be required from burning coal or coke in the cupola. That is to say, of a total of 4,267,924 calories needed per ton of metal, 2,853,888 will come from coke or coal in the cupola, and 2,024,500 will be electrical. This amounts to 3190 horse-power per ton of metal; and with fuel at £1 per ton, and electricity at 1 c. per 1000 calories (as in the French Alps) the manufacturing cost of the steel is worked out at 29·24 frs. per ton

Storage of Rain Water.

Saving rain water falling on extensive roofs is economy well worth considering in many localities. Consequently, some interest attaches to a communication on the subject addressed to the "Builder" by Mr. W. B. Hopkins, A.R.I.B.A. It had been stated that as a rough rule a storage capacity of 2 gallons for every square foot of horizontally measured catchment surface may be taken as sufficient to store the heaviest rainfall, and provide a reserve in time of drought. Upon this, Mr. Hopkins remarks that as 2 gallons on a square foot of area would be a depth of 4 inches, and as 4 inches of rainfall in one day is an exceedingly rare occurrence in an English district, this part of the statement may be considered trustworthy. But that a tank capacity of this amount will provide an adequate reserve in time of drought, is very much dependent upon the relative proportion of the catchment area to the amount of water required. The real question for the designer of the storage is, given the yearly amount of water required and the average yearly rainfall, how large must the tank be, and how large the catchment area, to ensure a full supply year in and year out over an indefinite number of years? Supposing an average yearly rainfall of 24 inches, Mr. Hopkins suggests that about two-thirds of this should be provided for. This is worked out as follows: Assuming the catchment area to be 1 square foot, and the mean annual rainfall (less evaporation) 24 inches, all the water being used, then the storage tank should hold two-thirds of 24 in. × 1 sq. ft. = two-thirds of 2 cubic feet = 1⅓ cubic foot = 8·3 gallons for every square foot of catchment area. This is very ample; and in circumstances where only the excess daily rainfall would require to be stored, a tank capacity equal to one-quarter of the minimum yearly fall would suffice.

To Measure the Current Consumption of Electric Lamps.

The practical difficulty of comparing the cost of electric and gas lighting is increased by the uncertainty which prevails as to the efficiency of incandescent electric lamps in actual service. An inquiry for this information was made at the last meeting of the Birmingham Section of the Institution of Electrical Engineers; but there was no answer forthcoming. We owe it to the "Ironmonger" to be able to state that this want has been supplied by Messrs. Everett, Edgecumbe, and Co., of 22, Charterhouse Square, E.C., who have produced an instrument which they call a "lamp-tester." It cannot be an expensive appliance; and it ought to be invaluable as a means of indicating what electric lamps are actually doing, in respect of current consumption, in the circuits from which they are supplied. The apparatus is nothing more nor less than an ammeter of a special make; and it may be used with either the direct or the alternating current. Any lamp may be taken off from its socket, and tested with the current from any convenient lamp-holder. When this is done, the pointer of the instrument moves over the scale, and at once indicates the current flowing through the lamp. The voltage of the supply and the rated candle power of the lamp being known, reference to a table which is supplied with the instrument gives the efficiency of the lamp in watts per candle-power. Of course, this involves the assumption that the illuminating power of the lamp is as rated; but a little allowance for age will enable this to be made approximately to average truth. The apparatus will also test lamps of unknown candle power, in so far as it will easily discriminate between the quantities of current proper for an 8, or a 16, or a 32 candle power lamp.

Emergency Repairs in Chemical Works.

Mr. F. J. R. Carulla, discussing the subject of emergencies and repairs in chemical works, notices with approval the commendation of reinforced concrete construction which has from time to time appeared in the "Journal." He specially mentioned the article which appeared in our columns on Jan. 14 last; and remarked that concrete walls might be frequently employed with advantage in chemical works. At any rate, the lower part of cast-iron columns might often be effectively protected by so casing them. The use of lead for this purpose is only permissible when space forbids the more massive concrete covering, and especially is it undesirable where the column is likely to be subjected to the action of moisture and weak acid. How powerful an action is thus set up may be seen in iron railings that have been fixed to stone walls by means of lead. Such railings became completely worn through at the junction of the two metals, unless they have been protected by frequent painting. Experience with ordinary brick walls certainly condemns them for vitriol works. Blue bricks are far and away cheaper in the long run. The only weak place is the joints. Ordinary mortar will not stand. A mortar or cement made of boiled tar and sand if used with blue bricks makes a wall that will stand any acid corrosion. Ordinary mortar is also much affected by the gases given off from the ammoniacal liquor of gas-works. The subject of lutes and cements that will stand the action of acids is one of great importance. Neither common mortar nor fire-clay is of any good; but plaster of paris is useful for an emergency patch. Leaks in leaden chambers, however, can be stopped with sulphate of baryta, which can be had finely ground and cheap. Mr. Carulla recommends that provision of it should be kept for the purpose, as a leak in a leaden pan will be readily stopped with a few handfuls of the substance. It is suggested that provision should also be kept of mixed raw linseed oil and lime water, with about ½ per cent. of ammonia, as an instant application for burns and scalds.

Stresses in Long Columns.

Mr. Charles Worthington has read a paper before the American Society of Civil Engineers on the subject of "Stresses in Long Columns," as to which the "Engineering Record" remarks that the nature of the subject is obscure, notwithstanding all that has been written about it in the past. The fact of the matter is that the long column is an essential feature of a great variety of engineering structures, while the theory of its strength remains largely conjectural. This is due to the indeterminate condition which prevails as to the ends of these members. The analysis of stress is affected by every such condition. Obviously, in order to reach tangible results, which means a formula that can be used in practical design, this indetermination must be exchanged for an assumption as to the conditions of loading which is perfectly arbitrary, and may or may not correspond with the facts of any particular case. The original data assumed by Euler had the advantage of simplicity and perfect definition; but they are never realized in engineering practice, nor is it likely that they ever will be. Such things as free or fixed ends do not really exist in fact. By means of such devices as the pin connection, something approximating to the conception of axial loading may be secured; but the friction of pins of ordinary size eliminates the ideal hinge joint. Equally unattainable is the fixed-end condition. However solid the ends and the anchoring of a column may be, its own elastic movements frustrate the endeavour to attain rigidity. The central loading of columns is therefore an assumption that is never realized. As a matter of structural possibility, the pin-end condition is for long columns the only one of even approximately determinate character, or that can be made so. Hence, whenever this is practicable in engineering design, it is best to make columns and struts end in pins; especially as tests of full-sized columns have shown that no other equally possible application of loading will better utilize the strength of the member, for its length and scantling. There are many conditions—like those of a viaduct or gasholder framing, where the columns are bolted down to piers at one end and secured to transverse girders at the other—in which the pin connection is inadmissible. In such circumstances the stresses upon the columns will be exceedingly complicated, and as indeterminate as complicated, or more so. The most that can be said in such conditions is that certain reasonable assumptions as to wind pressure, &c., can be made which are safe enough; but beyond that all is guesswork.

In reference to the recent balloon accident in Paris, the "Daily Telegraph" has received a letter (in which many "Journal" readers will be interested) from Sir David Salomons, who is a member of the Committee of the Aero Club de France. In pointing out the insufficiency of some of the theories advanced to account for the disaster, Sir David says: "If a lighted match were plunged into the interior of a balloon, it would cause no explosion, but simply be extinguished. Gas to explode must be mixed with air—must be a mixture of oxygen with hydrogen or other gas. It may therefore be presumed that a large leakage must have existed (in M. Severo's airship), and then probably the gas mixture was ignited by the exhaust gases or the hot metal near the exhaust of the motor. The danger is always present when motors are employed, in any portion of which high temperatures exist. Interesting as such experiments are to all who seek improvement in aerial locomotion, it must be remembered the danger will always be present until a 'cold motor' is employed, such as one worked by liquid air, with certain precautions even in this case. The most elaborate care in manufacture is no absolute guarantee against gas leakage in the envelope."

COMMUNICATED ARTICLES.

RETORT-HOUSES FOR INCLINED-RETORT SETTINGS AND THEIR DEVELOPMENT.

By EDWARD DRORY, Chief Engineer to the Imperial Continental Gas Association, Berlin.

[Two plates of illustrations accompany this article.]

It was in the early part of the year 1889 that I obtained from my Board of Directors the sanction to build one trial furnace with inclined retorts, having previously studied M. Coze's inclined system, and his first four settings, placed *dos-à-dos* in one single bench of brickwork. The first thing that struck me was that the shoots for filling the retorts were completely embedded in the brickwork; and that when the truck charged with coal was tilted and emptied through these cast-iron shoots into the sloping retorts, it would be impossible for the coal to form at each charge a perfect and even layer. It was soon clear that the perfect charging of the retorts was the main point of the system—the clean discharge of the coke being the result; and that, therefore, the charging arrangements must be accessible all round, and that the fall of the coal in filling the retort must be able to be regulated. Later on, various experiments and careful observations proved that coal of various sizes, broken, fine, mixed, &c., requires a slightly different manipulation with the slide, and a different angle of the bottom of the charging shoot; also in regard to the height at which the coal has to fall—into the top, middle, and bottom retorts.

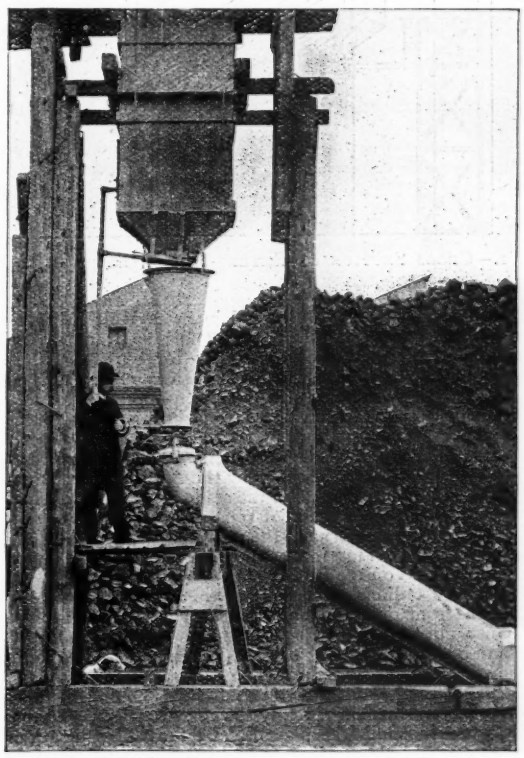
The erection of this trial furnace was begun on July 20, 1889; and on Nov. 5 following it was brought into action. It contained only seven retorts 11 ft. 6 in. long, and was built on the old fire-bar system; the object being to spend as little capital as possible on this trial, as the arrangement was quite new. The principal aim was to study the charging and the discharging question, the eventual loss in illuminating power, and the storage of coal ready for carbonization; the consumption of fuel being a secondary one at that time. This trial furnace after being in action for two years, passed through many alterations. One of the first improvements adopted (always in view of a much more important installation of ten or twelve furnaces in two benches to be constructed later on) was to have a coal-hopper over the furnace to contain coal for at least 24 hours; as also a removeable measuring hopper and charging-shoot to fill the retorts. Making use of the pressure of water we had on the works, a sort of hydraulic lift was constructed with an old 12-inch gas-pipe. The coal recipient was lifted, swung round (when up) over the hopper by a rope from below, and in knocking against an iron beam opened itself from the bottom and emptied the coal readily into the hopper. Thus the provision for 24 hours was soon made without any men being necessary on the top.

The charging of the inclined retorts was at first done by means of a sheet-iron scoop suspended to differential pulley-blocks, by which it was raised to the proper height for filling either of the three rows of retorts. The coal was discharged from the hopper above on to this scoop, which was then tipped by hand, and the coal slid into the retort. This very primitive charging arrangement had many defects; the principal one being that it was dependent on the skill and good will of the workman. It was necessary (before all) to remedy this, and to find an arrangement which would be more or less independent of the workman, and compel him to give the full charge, and at the same time ensuring a uniform layer of coal from the bottom to the top of the retort. The accompanying photograph represents the experiment made with such an arrangement in the year 1890, and which was later modified in many respects, but which led up to the form of construction adopted one year later with the second trial furnace with nine retorts, and two years later with the two benches of ten inclined settings, and which is still in use at the present day without having undergone any alteration.

The results of this experimental furnace, after having been subject to repeated improvements, having finally been very satisfactory, my Directors (who are always ready to encourage everything tending to the prosperity of our industry, and favourably inclined to any innovation which is likely to prove advantageous), sanctioned the erection of another trial furnace with nine retorts, 15 ft. 9 in. long, on the generator system. The arrangements for lifting the coal and charging the retorts remained the same as for the previous trial furnace erected in 1889. This second furnace with nine retorts was commenced on Sept. 24, 1891, and completed on Feb. 20, 1892, and was brought into action on March 11 following. After three-and-a-half months' working, the results were found to be so favourable—both with regard to the uniform heats obtained throughout and the consumption of fuel, &c.—that my Directors sanctioned the erection of two benches with five settings of nine retorts in each, on condition that these benches were to be placed in the existing retort-house, where formerly horizontal settings had been built, and which had to be demolished on account of old age.

The width of this retort-house being only 49 ft. 8 in., it was impossible to choose retorts 15 ft. 9 in. long; and therefore I took 11 ft. 6 in. retorts, rather than run the risk of seeing this opportunity of making experiments with ten furnaces with inclined retorts fall through. The distance between the furnaces also had to be less than the minimum limit—being only 19 ft. 8 in. I settled this important question by arranging that in summer time only one side should be in action, in order to reduce the heat between the benches as much as possible.

The erection of these two benches was begun on July 18, 1892; and they were put in action, one on Nov. 13 and the other on Dec. 2, 1892. It must be mentioned here that all the retorts of these two benches tapered towards the bottom by 2 inches, in order to enable the coke to slide out easily, and that the retorts, together with all the fire-clay materials, lumps, bricks, &c., were manufactured at our own retort factory on the works. These benches had only been in action a few days when it was found the smoke, dust, and vapour were so great in the retort-house that the men began to complain. I had the covering of the louvre ventilator on the top of the roof removed, and immediately great benefit was observed; the smoke, vapours, and dust escaping easily. Some of my professional brethren from Austria, Hungary, England, Germany, &c.—and they were not few—who came to study my slopers, were astonished to see this wide opening in the middle of the retort-house roof, which was quite uncommon hitherto. Their objection was that when it rained or snow fell in winter, the men would be prevented from working. My reply, however, was invariably the same: "It does not rain always, nor continually; and before the snow or the rain-drops reach the ground, they are evaporated. The chief thing is the health of the men; and they all like the roof open, and are satisfied with it." I also had a part of the roof opened over the two coal-sheds which formed part of the retort-house building; and this gave great relief to the men occupied with the hoppers and distributing the coals into them.



FIRST EXPERIMENT MADE AT THE ERDBERG GAS-WORKS, VIENNA, IN 1900, WITH A CHARGING CONTRIVANCE FOR AN INCLINED RETORT.

I confess that, with my present experience in slopers, I would perhaps not have built the two benches in the way they were erected, and as fig. 1 (p. 1484) shows. Perhaps turning the benches by 180°, and placing the charging-floor inside and the discharging-floor outside the house, and leaving the hoppers at their places near the main wall, would have been better.

GITSCHINER STRASSE GAS-WORKS, BERLIN.

[See Fig. 2. on Plate.]

This retort-house, which now contains 46 furnaces with nine

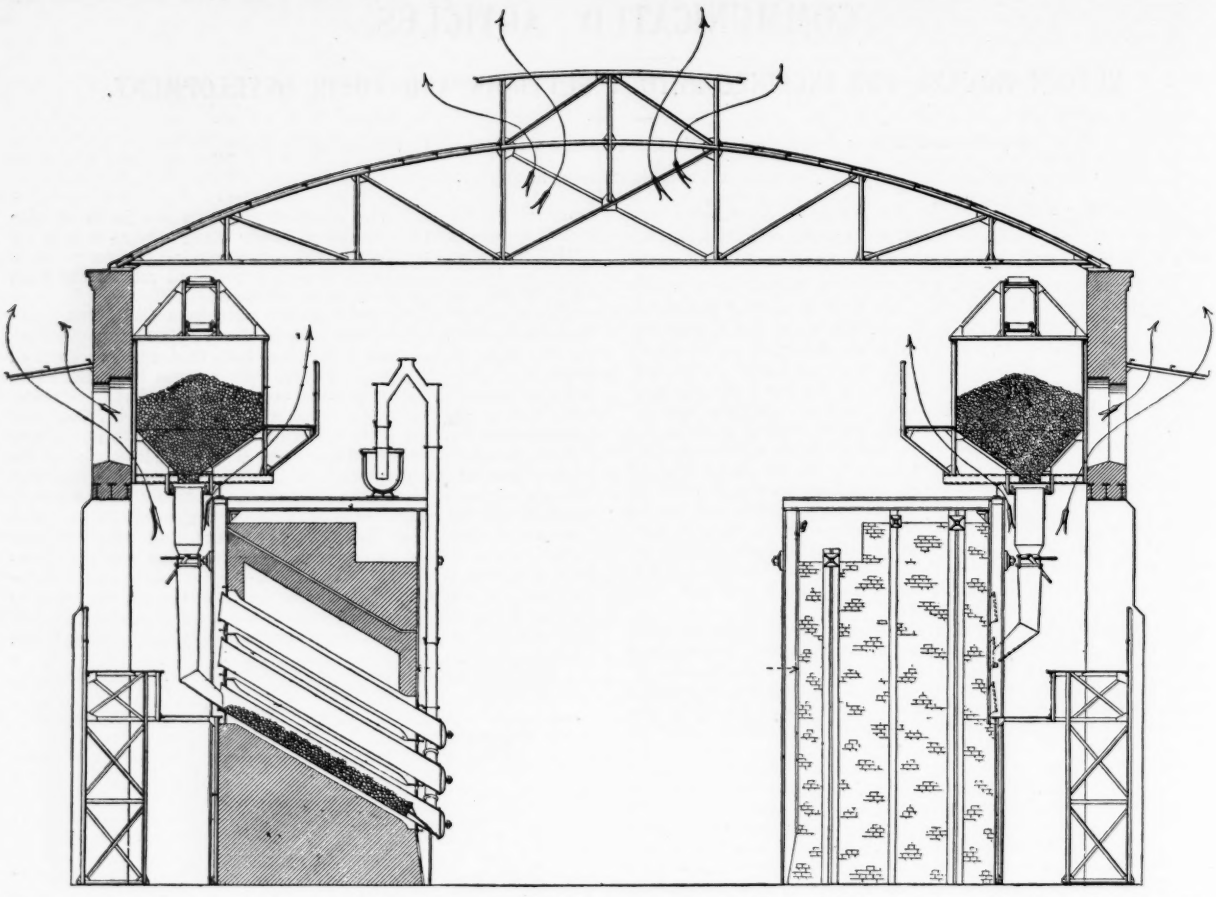


FIG. 1.—CROSS SECTION OF RETORT-HOUSE, ERECTED 1892, AT THE ERDBERG (VIENNA) WORKS OF THE IMPERIAL CONTINENTAL GAS ASSOCIATION.

inclined retorts each, 15 ft. 9 in. long, was built in 1870—for horizontals, of course—and lengthened in 1887, from the designs of Professor Schwedler, who adopted here for the first time his new system of roof-construction, which was then famous. This house, as will be seen, is—and this quite by chance—much better adapted to the inclined system than the Vienna one, as it has sufficient height and breadth. In January, 1897, 41 old horizontal furnaces were still in action. These were demolished, and 26 furnaces with 9 retorts each were erected by the Stettin Retort Factory, and put in action on Sept. 28 of the same year. Again I had the covering on the top of the roof removed to a width of 20 feet, which answered very well as to the men occupied on the charging-floor, but not so well for the coal-wheelers over the hoppers or the men occupied on the discharging-floor.

After many tedious experiments, we found that the highest point of the roof ought to be situated over the ascension-pipes. The house not allowing of this, openings were made the whole length and boarded up, as shown. The smoke and vapours did not, however, all escape through these openings; a portion of them finding their way through the middle opening of the roof, and thus inconveniencing greatly the coal-wheelers. To remedy this, a wooden shield was placed along the whole length of the side opening, and descending from it, and was attached to the roof girders by iron rods. This arrangement now answers all that can be claimed for a house of this construction. Three years later (in 1900), another four benches, with together 20 furnaces of nine retorts each, were added to the other 26 existing ones; and these now fill the house completely. The same arrangements for carrying off smoke, dust, vapour, &c., were adopted, with equally good results.

MARIENDORF RETORT-HOUSE, BERLIN.

[See Figs. 3 and 4 on Plate.]

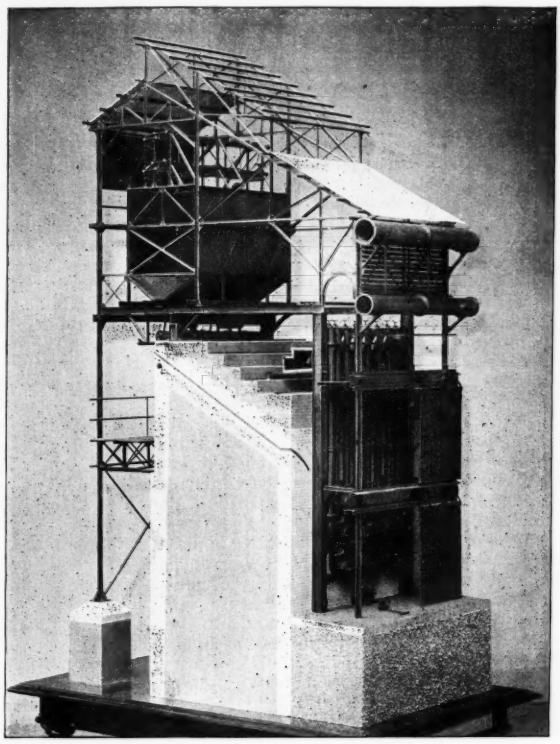
All the experience gained with the retort-houses at Vienna and at the Gitschiner Strasse Works, Berlin, was made use of in constructing this retort-house. The general idea for this entirely new gas-works being that all materials, gas, &c., should move in the direction of north to south, the plan of the retort-house was made in accordance therewith. The furnaces have been subdivided into four benches of eight, and two parallel rows of sixteen furnaces of nine retorts each. Between the two rows the ample distance of 42 feet was left, in order to secure good ventilation and to provide the room necessary for flues and chimneys—six in number, 74 feet high. The columns and roof principals have been placed in the axis of the division-walls between the furnaces, permitting perfect freedom for the stoking work both sides.

For the design of the elevation two principal rules were laid down: (1) To secure ventilation as perfect as possible, without exposing men or plant to wind and weather; and (2) to make the supports of the roof and coal-hoppers quite independent of the benches. The peculiar feature of this retort-house is the way in which I have carried out my ideas of providing perfect ventilation for all concerned, by constructing the house in two independent parts; the space in between the benches and hoppers being entirely without any roof construction at all (see photographs of the model for a retort-house which I had made in Vienna in 1893, and which was the origin of the present form of construction). The two rows of furnaces opposite each other, together with the gable walls, form a kind of open courtyard, giving all the necessary protection against the wind. The ridge of the roof, crowned throughout by a broad, open ventilator, has been placed just above the ascension-pipes; and the, at the first glance, somewhat peculiar shape of the roof is thus fully explained.

On the charging side of the furnaces opposite to each division-wall, wrought-iron columns are put up for the support of charging-stages, coal-hoppers, and retort-house roof, connected with each other in all four directions by latticework girders and diagonals. These columns form a rigid scaffold, well fitted to support the heavy coal-hoppers by means of brackets projecting towards the furnaces, and to carry the principals of the roof, the upper bearings of which are fixed on the top of each column. From here the top girder of the principal rises, at first at a moderate rate, to the height of the ventilator, then goes down with a sharp fall, till it reaches at last the vertical and forms part of the outside wall. The bottom girder is shaped as a polygon; rejoining the top one above the moveable bearing at the height of the drawing-stage.

The charging-stage consists, as in Vienna, of two wrought-iron steps. The top one, on which the stokers have to move, is sufficiently high to enable them to look into every retort, and forms a characteristic feature of the system; the space between the two steps being open for ventilation. The discharging-stage, 10½ feet above the ground and 18 feet wide, is paved with Dutch tiles, and supported by Monier arches, wrought-iron girders, and cast-iron columns. Below this stage the walls of the retort-house have projecting pillars for taking up the stress of the roof principals. Above this height, there is nothing but iron framework, with 5 inches of brick nogging between the girders.

The open ventilator giving plenty of light, no windows were necessary for the retort-house; but large sliding doors of corrugated iron in front of each furnace, and a fair-sized opening with fanlight-shutters above them, give access to large quantities of air. The wooden covered roof is felted and tarred. The appearance of the house, though it was built without any attempt at architectural ornamentation, is by no means ugly (see figs. 5 and 6 on plate). The ventilation is perfect; so much so that the men working on the charging and discharging floors are always in quite pure air.



MODEL OF THE FIRST PROJECT FOR A RETORT-HOUSE ON THE INCLINED SYSTEM (VIENNA, 1893).

The 32 settings of nine retorts each were designed in the Berlin office of the Imperial Continental Gas Association, and built by the Stettin Retort Factory in nine months. The internal dimensions of the retorts are 15 ft. 9 in. by 21 in. by 15 in. The generator is placed inside the furnace. The regeneration is very simple, but effective; the last flue of the waste gases being perfectly black. A boiler built-in supplies the steam for keeping the clinkers soft. Clinkering is done every 48 hours only. The make per retort and per day is 15,000 cubic feet, and the make per ton 11,000 cubic feet; half of the coal being Durham and the other half Silesian. The fuel used is 12 per cent. by weight of the coal carbonized.

There is a separate hydraulic above every furnace, connected by a valve with the foul-gas main, which runs over the whole length of the bench, and is in communication with a second main outside round the walls of the house, so that the passage and the temperature of the gas can be varied according to circumstances. The tar is taken off by a separate pipe communicating with a seal-pot at the ground level.

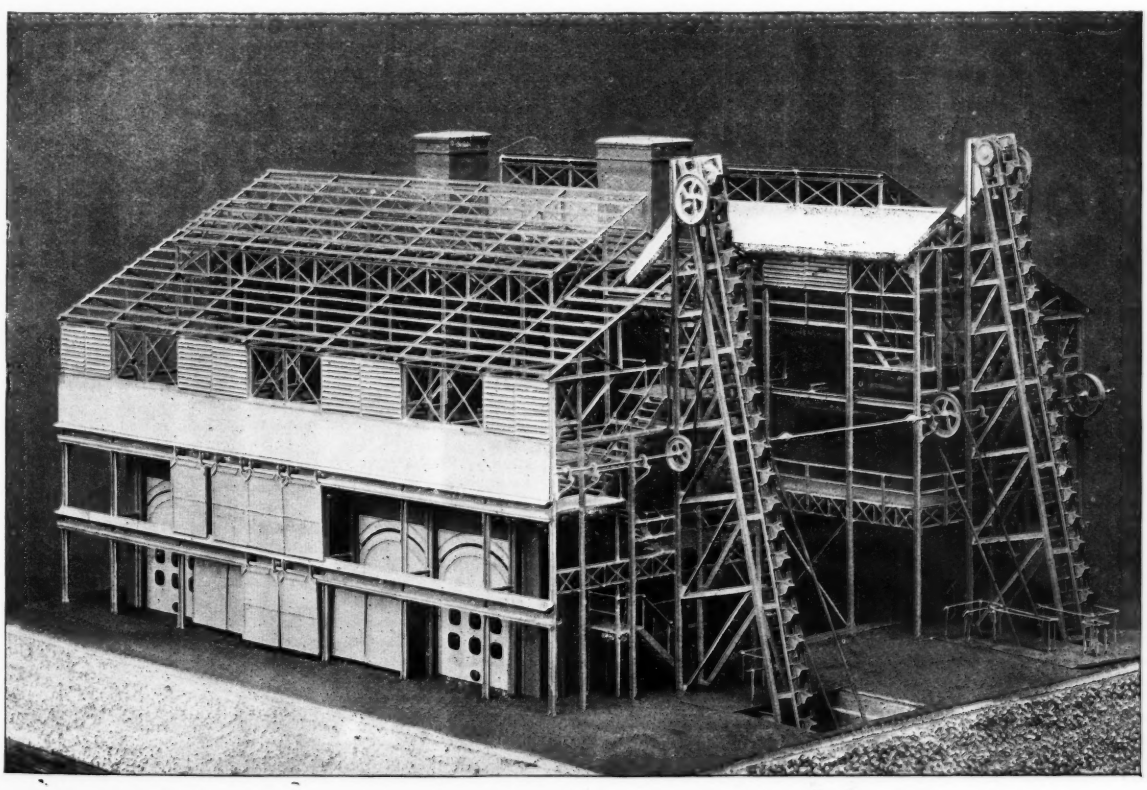
With regard to the coal supply, the installation has been provided with a duplicate set of coal crushing and elevating apparatus. The elevators are cased-in completely. As the coal is discharged from the buckets of the two elevators, it is conveyed by means of two 20-inch wide push-plate conveyors, which store the coal automatically along the whole length of the double row of hoppers. Each elevator can work into each conveyor by the help of a cross-conveyor, which can be moved in both directions. The coal-handling plant is capable of crushing, elevating, and storing coal in the hoppers at the rate of 80 tons an hour, and is driven by means of two 20-horse power steam-engines. The coal-hoppers extend over the whole length of the benches, and contain a coal supply for more than 24 hours.

The feeding arrangements consist of two openings, underneath the coal-hopper, with circular slides above each furnace. The coal falls through these into measuring-hoppers running on suspended rails, with the charging-shoot attached to their bottom end; there being a special hopper and shoot for each tier of retorts. By this means, the coal is charged into the retorts in a remarkably uniform layer.

The removal and quenching of the coke is accomplished by the De Brouwer conveyor (one for every bench), the top edge of which is on the discharging-floor level, the chain returning beneath the trough. During the six months it has been in use, this conveyor has caused hardly any trouble, and has given much satisfaction. Smoke, vapours, and dust in the retort-house have been reduced to a minimum. The amount of breeze produced by the whole manipulation of coke—viz., quenching, removing, elevating, dropping into hoppers, breaking, sieving, stacking, taking from stock, &c.—has not exceeded 5·2 per cent. by weight of the coal carbonized.

Taking all in all, the Mariendorf retort-house has fully realized all expectations with regard to output of gas, economy in labour and fuel, ventilation, cleanliness, and convenience, and has been from the beginning a source of constant satisfaction to everybody employed in it. No inconvenience whatever has been caused by rain, snow, or severe frost during the six months this house has been in action; and on April 14 last, a very severe thunderstorm, and one of the heaviest rainfalls ever known in Berlin, subjected it to a very severe test. All the water, however, was carried off directly by the sewers; and the ground between the furnaces in action was perfectly dry within two minutes after the cessation of the rain.

With regard to the cost of the house, I append a detailed statement showing each item separately; and I should be much



MODEL OF THE FIRST PROJECT FOR A RETORT-HOUSE ON THE INCLINED SYSTEM (VIENNA, 1893).

obliged to any of my colleagues if they would publish their results on a similar footing.

MARIENDORF GAS-WORKS.

Cost of No. 2 Retort-House, containing 32 Furnaces with 9 Inclined Retorts each, 16 Feet in Length, and 29·86 Cubic Feet Capacity.

Total cubical capacity of 288 retorts = 8600 cubic feet.
Superficial area of retort-house = 27,329·8 square feet.

	Cost.	Cost per Cubic Foot of Retort Capacity.	Cost per Square Foot of Area.	Cost per Lineal Foot of Retort. (4611 Lin. Feet.)	Cost per Ton of Coal Carbonized in 200 Days (80,000 Tons).
	£	£ s. d.	£ s. d.	£ s. d.	s. d.
House proper—					
Masonry	2,614				
Carpenter's work .	1,198				
Ironwork of walls, roof, sub-construction of hoppers .	6,503				
Charging, discharging floors, stairs, gangways . . .	3,910				
Painter's work . .	515				
	14,740	1 14 0	0 10 9·0	3 4 0·0	3 8·2
Furnaces (32) . . .	33,190				
Mouthpieces, ascension pipes, hydraulic mains, buckstaves .	4,100				
Chimneys (6) . . .	1,815				
	39,105	4 11 0	1 9 8·0	8 10 0·0	9 9·3
Foundations of house	738				
Foundations of furnaces and chimneys	1,464				
	2,202	0 5 1	0 1 7·3	0 9 6·6	0 6·7
Coal plant—					
Hoppers	3,596				
2 conveyors . . .	3,375				
2 elevators . . .	743				
2 crushers . . .	547				
2 cellars for same and engine-house outside	1,193				
2 steam-engines. .	608				
Charging-shoots. .	292				
	10,354	1 4 0	0 7 6·0	2 5 0·0	2 7·0
De Brouwer's hot-coke conveyor inside house	2,645	0 6 2	0 2 1·0	0 11 6·0	0 8·0
Totals	69,046	8 0 3	2 11 7·3	15 0 0·6	17 3 2

Remarks.

Brickwork.—The house was built in 1900, when prices were at their highest. The cost of 1 cubic yard of brickwork under ground was 15s. 9d.; do. above ground, 17s. 7d.

Ironwork.—The cost of 1 ton of wrought iron of walls and roof was £4 14s.; do. of supports of hoppers, £15; do. of stairs and gangways, £17 7s. In 1902 the cost of 1 ton of wrought-iron construction is from £10 5s. to £11 5s.

In conclusion, I would like to add that if any of my professional brethren are in the happy position of having to design a retort-house for inclined furnaces, I would invite them to try my system; and I am sure they will find some advantages they will perhaps not have expected. I would particularly ask the attention of my colleages residing in hot climates, for which the system is eminently adapted. If the space in front of the furnaces is reduced to (say) 3 feet, and the outside wall consists of sliding doors of corrugated iron (as shown on the photograph of the model of 1893, and which I exhibited at Leipzig in 1897 during the Congress of German Gas and Water Engineers), and the De Brouwer conveyor for the hot coke is put outside the house, the stokers will suffer certainly considerably less than in the retort-houses of the usual European style.

A French Reservoir Dam.—"Le Génie Civil" recently gave some particulars of a dam which has been built in the deep valley of Lauch, in the Vosges Mountains, for a reservoir having a capacity of nearly 200 million gallons. The maximum level of the lake formed by it is about 3000 feet above the sea. The dam has the shape of an arc, with a radius of 990 yards, the chord of which is 250 yards. The convex part is turned towards the lake, 36 acres in extent, the formation of which it determines. The dam is 65 feet high. There are four weirs—two at either end of the dam. They are 33 feet long, and at the ordinary water level carry away 9000 gallons per second. The bulk of the stonework is 9,884,000 cubic feet; and it cost 1,100,000 frs. (£44,000). Outside the dam is a sloping embankment, which came to 120,000 frs. more; making the total outlay 1,220,000 frs. (£48,800).

THE CONDENSATION OF COAL GAS.

By Harold G. Colman, of Birmingham.

The recent papers of Mr. Charles Carpenter and Mr. A. F. Browne, with the subsequent discussions, have directed renewed attention to the subject of condensation, especially from the point of view of the complete removal of naphthalene in the process; and the same interest has likewise been aroused by the proposal to appoint a Committee of the Southern District Association to investigate this question. The present time therefore appears opportune for the publication of any ideas on the subject which have been formed by those who have studied it, in the hope that such may be found of use in that investigation. In this article, therefore, the writer proposes to enunciate the views to which he has been led by a study of the literature of the question and his own experiments.

Attention is confined here to the separation of the tar vapours from the gas, without consideration of the condensation of the aqueous vapour (which has been recently so fully dealt with by Mr. Browne), beyond stating the view that its influence on the removal of naphthalene, and the subsequent illuminating power of the gas, is of only subsidiary importance, as water does not dissolve, and is not dissolved by the tar constituents to any considerable extent; and its separation therefore takes place practically as it would if no tarry vapours were present.

The aim of condensation may be defined as the reduction of the gas to the atmospheric temperature, and the simultaneous removal, as completely as possible, of all substances which are not permanent gases at that temperature, with the exception of the lowest boiling hydrocarbons (practically benzene and toluene). Of these latter, it is desired to keep in the gas the maximum quantity it is capable of retaining at the lowest temperature to which it may be exposed during distribution.

The process of condensation commences as soon as the gas leaves the hottest portions of the retort, and at first the temperature falls with great rapidity—being reduced, after traversing the mouthpiece, ascension-pipe, and hydraulic main, to from 140° to 160° Fahr. This rapid reduction at the commencement is due to several causes. Thus, the difference between the temperature of the gas and that of the atmosphere is much greater than in the later stages, while the speed with which it travels at this point is low; further, the amount of heat required to be removed per degree of temperature lost is much smaller than it is later on, being only that due to the specific heat of the gases and the latent heat of the tar vapours which liquefy, both of which values are low. The liquefaction of aqueous vapour, which, as Mr. Browne has shown, evolves the great bulk of the heat to be removed in condensation, cannot take place until the gas is fully saturated with it; and this does not occur until the temperature has fallen at least below 212°.

By the time the gas reaches the hydraulic main, the greater part of the heavy tar vapours has condensed to the liquid form, and is carried with the gas in the form of a dense fog of liquid particles or vesicles, the larger proportion of which separates in the bubbling of the gas through the seal, and in modern practice is removed as quickly as possible and allowed to have no further action on the gas. A considerable proportion of the heavy tar-fog, however, is still retained in the gas, and passes with it into the foul main; and it is to the subsequent behaviour of the fog that the writer wishes to draw special attention, as in his opinion this plays the chief part in the "washing" actions taking place in the later stages of cooling. The aggregate surface of such fog must be enormous, and by comparison the surface of the pipes through which the gas passes is small. Moreover, the fog is so disseminated through the gas that every particle of the latter must come into intimate contact with it; whereas the tar deposited on the surface of the pipes, or flowing as a stream along them, is only in contact with the portion of the gas travelling close to it.

Each particle of the fog, when formed, tends to dissolve from the gas surrounding it the hydrocarbons still present as vapour; and the amount of each of these dissolved at any particular temperature will depend roughly on three factors: (1) The amount of the particular hydrocarbon present in the gas; (2) its proximity to the condensing point; and (3) the composition of the particle. As the gas passes along the foul main, its temperature slowly gets lower, and the solvent power of the fog for the lower-boiling vapours increases, while simultaneously much of the fog is removed from the gas by friction with the tarry sides of the main, and by subsidence. The general tendency is therefore for the fog to get richer in low-boiling and poorer in high-boiling constituents during its passage through the foul main; and the longer the main and the slower the velocity of the gas, the greater will be the extent to which the heavy tars are removed before the condenser.

When the latter is reached, the rate of cooling becomes more rapid; and in the earlier part the bulk of the light oils separates —at first in the form of fog. The light oils form the best reagent for removing the naphthalene still present as vapour in the gas; and their solvent power for the latter decreases with the amount of heavy tar (itself containing naphthalene) they have already dissolved, while it increases with the fall of the temperature of the gas in which it is carried forward. The removal of the last portions of the naphthalene vapour, therefore, demands that as little heavy tar as possible should be dissolved in the light oils, and that

the latter should be carried forward to the coolest portions of the condenser. Moreover, if the heavy tars get forward, they are capable of dissolving at the lower temperature a portion of the benzene vapour still present in large quantity, thus effecting a reduction in the illuminating power.

In its main outlines, the view thus deduced is in agreement with the generally accepted opinion that the best results for illuminating power, and most complete removal of naphthalene, are brought about by the removal of heavy tars as soon as possible, and by long continued contact of the gas with the light oils. It differs from it in regarding the stream of tar flowing with the gas as of minor importance, and attributes the chief action to the tar-fog suspended in the gas. In following the matter further, this leads to conclusions which are not in accordance with common practice. The conveying of the gas through a great length of foul main at a low speed is favourable, inasmuch as it allows of the deposition of much heavy tar which would otherwise have reached the condenser; but the continuance in the condensers of slow cooling is not advantageous, inasmuch as, owing to the low velocity of the gas and the longer time it is in passing through the condensers, the light oil-fog is largely deposited and removed from further action on the gas before it reaches the cold end of the condenser, where its solvent power for naphthalene is greatest. Hence if these views are correct, it follows that, while slow condensation up to a certain point is desirable, the rate of cooling at the later stages must be *sufficiently rapid to carry the light oil-fog formed at the inlet to the outlet of the condenser*. This conclusion is in agreement with the view expressed by Mr. Carpenter and Mr. Browne—that an accelerated rate of condensation is required for the removal of naphthalene, with the proviso, however, that the heavy tars must have been previously removed from the gas as completely as possible. If this is not the case, quick condensation will not, for the reasons given above, effect the sufficient removal of the naphthalene, but will also bring about the absorption of benzene vapour which would otherwise have remained in the gas—thereby decreasing the illuminating power.

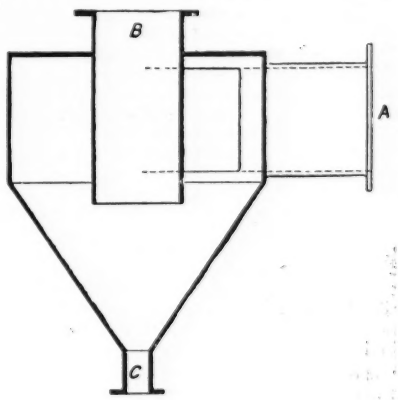
Evidence in favour of this view is found in the fact that stoppages from naphthalene are much more frequent in the summer than in the winter; many works being entirely free from this trouble during the winter months. At the latter period, owing to lower atmospheric temperature, the rate of condensation is decidedly higher; and therefore a much greater quantity of light oils must separate in a given volume of the condenser than in the summer—resulting in the formation of a much denser fog. At the same time, the velocity of the gas is much higher; and both these factors cause an increase in the quantity of the fog which reaches the cold end of the condenser, thus bringing about more complete elimination of the naphthalene. The lower temperature at the outlet in the winter also assists matters, as the light oils are thereby enabled to dissolve a higher percentage of naphthalene. The mere lowering of the temperature of the gas from 75° to 60° *in the absence of solvents* cannot, however, be expected to effect much reduction in the naphthalene, inasmuch as the quantity present in gas which has only been cooled to 75° is less in many cases than is necessary to saturate it at 60°. This was shown by a series of tests made last summer on two streams of gas, both of which were cooled to from 70° to 75° in atmospheric condensers, while one of the streams was subsequently cooled by means of water condensers to 60°. The average difference between the amount of naphthalene in the two streams was very slight; and even this difference was within the limits of experimental error.

The point next to be considered, assuming these views to be in the main true, is the manner in which the process of condensation can be modified to bring about the conditions which are most favourable—viz.: (1) The complete removal of the heavy tar fog before the condenser; and (2) ensuring the presence of a sufficient quantity of light oil-fog in the colder portions of the condenser.

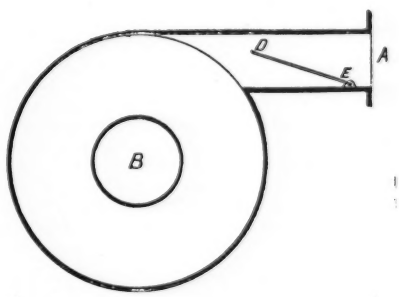
With regard to the first point, it has already been stated that this object is in part obtained by employing long foul mains of ample size; but even when this is done, the gas at the condenser inlet still contains a fairly dense fog. The first step advisable, therefore, appears to be, to supplement, or to replace, what Mr. Browne describes as "these miles of pipes" by a mechanical separator. With this object, the writer proposed, a year or two ago, the employment at the condenser-inlet of a centrifugal separator modelled on the lines of the well-known "Cyclone" dust-collector. The construction of the apparatus will be readily seen from the accompanying diagrams, in which fig. 1 represents a vertical section and fig. 2 a horizontal section of the cylindrical portion. The gas enters at A through a pipe of oblong section at a tangent, thus bringing about a rapid circular motion of the gas in the cone. Any solid or liquid particles are driven by centrifugal force to the circumference, and fall to the bottom, where they are taken off by the pipe C to a seal-pot. The outlet is at the centre of the cone, so that the gas is drawn off at the point where it is freed from suspended particles. By means of the flap-valve D, hinged at E, the velocity of the gas as it enters can be increased to any desired amount. The reasons for the selection of this form of separator were that the writer knew, from previous experience, how effective it was in removing the finest particles of flour dust from the fan-exhaust in flour-mills; and, further, because the construction is so simple and open that blocks are hardly likely to occur, and (if formed) can be readily removed. Moreover, the back-pressure thrown by the apparatus is extremely small.

Messrs. Simon Limited, of Manchester, who are the makers of the "Cyclone" dust-collector, kindly supplied an experimental apparatus, which was tried on a small plant carbonizing 5 tons of coal per diem; and the test showed a very complete removal of the tar-fog. The gas at the inlet, when allowed to impinge on blotting-paper for 30 seconds, gave a thick tarry stain, which soaked right through the paper; while at the outlet, in the same time, only a faint brown stain was obtained on the surface of the paper. The size of the inlet-pipe was 4 in. by 3 in., making the average velocity of the gas 7 feet per second with the flap-valve full open; and under these conditions the back-pressure was 1-10th inch. When the opening was reduced by closing the flap to 4 in. by ½ in., making the velocity of the gas 42 feet per second, the back-pressure only rose to 4-10ths. But the action of the apparatus at the lower velocity was so complete that no further advantage was obtained at the higher velocity. The separated tar was very thick, and contained large quantities of solid particles. A series of tests was made to ascertain the effect of the process on the illuminating power, and showed an increase of over a candle when the apparatus was at work, which was lost when it was bye-passed. Unfortunately, at the time these experiments were made, no test was available for determining the effect on the naphthalene.

This test having only been made on a small scale, while it proves the efficacy of the plan for removing the tarry particles, cannot be taken as conclusive as regards the effect on the illuminating power, as both this and the removal of the naphthalene



—Fig 1.—



—Fig. 2.—

depend so much on the exact conditions, and it is impossible to reproduce the large scale conditions accurately on the small scale. It may be remarked, in passing, that this apparatus might be employed for other purposes on a gas-works; for example, as a tar-separator for the gas after passing the condensers; and also, with suitable modifications, for removing the dust and tar from the producer gas used for heating the retorts, where this is made in outside producers.

Instead of the centrifugal separator, other methods might be adopted for the removal of tar-fog at the condenser-inlet. Thus a Pelouze-Audouin condenser would probably be effective, though perhaps more liable to blocks; and the series of perforated baffle-plates employed by Mr. Child at Romford (*ante* p. 629) would also act in the same manner. It is interesting to note that, employing these plates, no trouble is experienced at Romford from naphthalene stoppages, in spite of the use of Durham coal—which favours the view now under consideration. The apparatus known as the Aitken and Young "Analyzer," which was much discussed some twenty years ago, must, among other actions, also have had the same effect; and it was claimed at the time that where this was adopted all naphthalene stoppages disappeared.

Turning now to the second object—the carrying forward of the light oil-fog to the cold end of the condenser—the readiest method of effecting this appears to be the plan adopted by Mr. Carpenter

of using a water-cooled condenser, in which the rate of cooling can be controlled at all times, given a sufficient supply of cold water. But while this plan may be adopted in the case of new works or extensions, the replacement of atmospheric by water-cooled condensers in existing plant would entail a heavy expenditure, and some other method appears desirable by which the object aimed at can be obtained in atmospheric condensers.

Several methods have been suggested to this end. Mr. Browne has recently proposed to enclose the atmospheric condensers, and use an artificially cooled air-current as the cooling agent, thus practically reproducing the winter conditions throughout the year. Messrs. Young and S. and T. Glover have also proposed two plans with this object: (1) Carbonizing a small percentage of cannel at low temperature, and introducing the gas, freed from heavy tars, near the cool end of the condenser; (2) saturating a current of gas with light oils by passing it over a large surface of the latter heated by a steam coil, and introducing this at the same point. The action is the same in both cases. The hot gas, laden with light oil vapours, is suddenly reduced in temperature by mixing with the main stream of cooled gas, and deposits the light oil in the form of a fog, which then dissolves the naphthalene remaining in the gas. The first method has been successfully tried by Mr. S. Glover at St. Helens, and the second by Mr. T. Glover at West Bromwich.

The disadvantage of these two plans lies in the fact that, in the one case, the light oils have to be prepared by carbonizing a portion of the coal under different conditions to the rest; and, in the other that the light oils, which have been actually produced at the gas-works and sent away with the tar, must be repurchased. The writer is strongly of opinion that the amount of light oils, present in the hot gas, even under the most unfavourable conditions, is quite sufficient, if employed in a right manner, to effect the reduction of naphthalene to a safe limit; and that it is only a question of finding the right conditions. Many experiments have been made in this direction; and from the results of these the writer has proposed two methods of obtaining the desired end,* which have given favourable results on the small scale. Large-scale experiments are, however, not yet sufficiently advanced for publication; but they are being continued during the present summer.

The death took place at Coventry, on Saturday, the 24th ult., at an advanced age, of Mr. T. B. R. Ball, who for about half-a-century had been a watch manufacturer in the city. Deceased was father of Mr. T. B. Ball, of Rochdale, to whom we offer our sympathy in the loss he has sustained.

We learn that Mr. Maurice Graham, of Messrs. Graham, Morton, and Co., Limited, of Leeds, has arrived in England after a tour through the United States, where he took the opportunity besides visiting gas-works, &c., to inspect many engineering works, steel works, and collieries. Mr. Graham was impressed with the splendid equipment and organization more particularly in these works, and has decided in future to take full advantage of the many improvements which he found. He informs us that he has made working arrangements with Messrs. Adam Weber Sons, of New York, for installations of inclined retorts in America and Canada. He has also entered in an arrangement with the John A. Mead Manufacturing Company, of New York, who are well-known makers of elevating and conveying machinery in the United States, and have equipped many of the large power and electric light stations, including the Manhattan Power Station, Ninety-Sixth Street, which is fitted with the M'Caslin conveyor. As Messrs. Graham, Morton, and Co. are about to build large new engineering works in Leeds, in place of the three works they now possess, Mr. Graham has much appreciated the opportunities his visit has afforded to inspect the American system of equipment and organization.

We have received from the office of the "Morning Post" an elaborately got-up volume bearing the title of "Great Britain: Her Finance and Commerce." It is the *souvenir* edition of that paper, and has been produced for gratuitous distribution through the British Consuls, Exchanges, &c., in all parts of the world. We gather from a letter accompanying the book that some eighteen months ago an advertiser, who had contracted for a certain number of pages in the paper for the purpose of his business, was found by the proprietor to be obtaining large sums of money from trading firms for advertisements in a work bearing the title given above, representing himself to be an agent for the paper. On an injunction being obtained against him, he and his principal assistants promptly left England, and have not returned. Recognizing that many firms had parted with their money in the belief that they were dealing with the "Morning Post," the Proprietor determined to bring out the projected volume at his own cost. With this brief explanation for the existence of the work, it only remains to say that it is a large quarto volume of about 600 pages, the size of "King's Treatise on Coal Gas," and that among its forty articles on various subjects, which are preceded by a history of the "Morning Post," are the following bearing upon the industry with which our readers are identified: "Coal Gas and its Uses," by Mr. P. Robertson; "Oil as an Illuminant," by Professor Lewes; "Bye-Products from Coal," by Dr. S. Rideal; and "The British Coal Trade," by Mr. E. Dodshon. The book is well printed and profusely illustrated, and its preparation and production must have entailed very heavy expense.

* See "JOURNAL," Vol. LXXV., p. 405.

TECHNICAL RECORD.

AN IMPROVED RECUPERATIVE INCANDESCENT GAS-LAMP.

Since we first noticed the adaptation of the recuperative principle to incandescent gas lighting, some considerable interest has been taken in the Podmore and Thomas lamp, and that interest has been heightened by the tests which Mr. Thomas Holgate referred to in his presidential address to the Institution of Gas Engineers. Mr. Holgate ascribed to the lamp the high maximum illuminating power of 49 candles per cubic foot of gas; and this, it should be explained, was with the form of lamp as originally constructed. Speaking generally, Mr. Holgate said: "The presence of currents of cold air impinging on the mantle, the effect of hot gas or hot air supplied to the mixing-bulb, or of warm air to the exterior of the mantle, all have a distinct effect on luminosity; and, as a consequence, with a good street lantern, in which the air is admitted at the top, well protected from draughts, a higher result is obtained than with an open atmosphere." Now all these are the exact conditions which obtain in the Podmore and Thomas lamp. The heat from the incandescent mantle is partly restored to the burning flame by employing it to heat the air mixed with the gas; and no unheated air, in fact, can gain access to the interior or exterior of the mantle without being first heated. This, so far as the supply to the burner is concerned, is accomplished in this wise: The air is first admitted to the lantern hood, in which is a chamber with air admission holes of a size properly proportioned to the quantity of air required for the proper feeding of the flame. The air is partially heated, by its entrance into the hood, before it passes into the inner chamber, where it becomes superheated. A pipe connects the chamber with the gas service-pipe just below the burner; and the air is sucked down the feed-pipe by the flow of gas. At the point where the air and gas unite, the pipe is so hot that it is impossible to bear the hand upon it; so that the two conditions mentioned by Mr. Holgate as essential to the obtaining of the best results—a hot gas and air supply to the burner—are secured. The air supplied to the outside of the mantle is admitted to the lantern in such thin streams that it cannot fail to become highly heated before reaching the mantle.

A great deal of time has recently been spent by the patentees in working out some small, but important alterations in the lamp. Perhaps the main one is in making such changes in the form of the globe-holder that only a definite stream of warm air is admitted to the exterior of the mantle, and that stream is so directed as to pass at a fixed point on to the side of the mantle and then travel rapidly upwards its full length. A little experiment with the smoke from a piece of smouldering brown paper shows absolutely the travel of the current of air on the outside of the mantle; and it proves that the whole length of the mantle gets equally supplied with heated air. This is accomplished by the form of the glass holder and its air-inlets, and by the special shape of the glass itself. Comparing the lamp as now made with the old form, there is a distinct difference in the brilliance of the light; and as the changes refer principally to the direction of the currents of the air on to the mantle, the improvement goes to support Mr. Holgate's point as to the importance of their influence. In the experiments that the makers made with the lamp, the variations in luminosity were marked with the slight changes made in the direction of the flow of the currents in order to find the best way of attaining the highest result. Independent photometrical tests are not yet available to show the value obtained per cubic foot of gas with the lamp as now arranged. But if Mr. Holgate secured 49 candles per cubic foot with the first form, there is little doubt that a still higher efficiency will now be registered.

Experiments have also been made with the lamp at varying rates of gas consumption; and the maximum result obtained per cubic foot is when the consumption is regulated to about 5 cubic feet per hour. Without taking credit for the improvements that have been made, and adopting Mr. Holgate's figure of 49 candles per cubic foot, and multiplying it by 5 cubic feet, we have an illuminating power of 245 candles. But it is claimed that it is higher than that now. At Maidenhead, outside the Technical Schools, a lamp containing a cluster of three burners was fixed on Jan. 28 last. A test of this lamp by Mr. A. F. Phillips credits it with a total illuminating power of 882 candles, or 294 candles per burner—the total consumption of the three burners being 15 cubic feet per hour.

Another point about the lamp is that experience shows that any vibration is conducted to the head of the lamp, and not to the burner. This is accounted for by the fact that the hot-air supply-pipe leading from the chamber in the hood is jointed to the gas service-pipe, while the burner, which is provided with a flange a short distance from the bottom, merely sits loosely in the top of the service-pipe—the weight of the burner and the finely finished flange and connection at the top of the service-pipe making a perfectly gas-tight joint.

These are a few new points about the lamp which are worth calling attention to, in view of Mr. Holgate's reference to it and the system which it embodies in his recent presidential address.

THE MIDLAND ASSOCIATION VISIT TO MALVERN.

Two saloon carriages were attached to the South Wales Express which left Snow Hill Station, Birmingham, about 10.15 last Thursday morning; and in these carriages were a goodly number of the members of the Midland Association of Gas Managers, accompanied by their President (Mr. Charles Hunt), Vice-President (Mr. Charles Meiklejohn), and Hon. Secretary (Mr. A. Cooke). They were *en route* for Malvern—one of the loveliest of the health-giving resorts of inner England—where they were to be the guests for the day of the District Council and of their Engineer (Mr. H. P. Maybury). At the various stations—Stourbridge Junction in particular—the party were reinforced by newcomers; and when the train drew up at Malvern, the Chairman of the District Council (Dr. H. E. Dixey, J.P.), the Chairman of the Gas and Water Committee (Mr. F. A. Moerschell), and Mr. Maybury found it quite a formidable, though pleasant, task to welcome their numerous visitors.

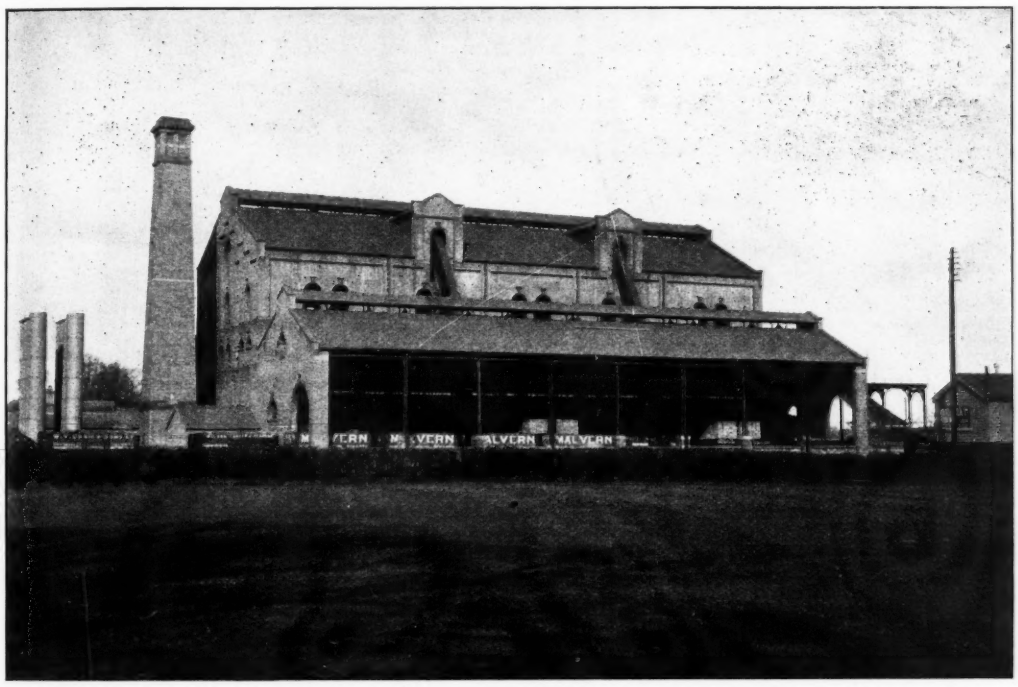


FIG. 1.—RETORT-HOUSE AND COAL-STORE.

FIG. 2.—NORTH END OF RETORT-HOUSE, SHOWING COKE HANDLING AND SORTING PLANT.

The large number of members present had been anticipated, for outside the station there was a long line of coaches waiting to convey the party on the first stage of a day which was to contain for them so much rich enjoyment. When the station was left, and the faces of the members were set for the gas-works, the bright sunshine and the crisp morning air soon spread among them a spirit of animation, which accompanied them throughout the day. As the carriages rolled along the clean and well-kept streets, everywhere seemed to be—nay was—a certificate to the enterprise of the local government, who, with an energetic and trusted, because tried and fully proved, Surveyor (Mr. Maybury is not only Gas and Water Engineer, but is entrusted with the well-being of the town so far as the roads and sanitary works are concerned), have a very sensible belief in order, maintenance, and improvement being vital to the retention of the good name of the town. The clean and splendidly surfaced roads and footpaths, the shapely lamp-posts, and the up-to-date lanterns, all fitted with incandescent burners and sound mantles, were among the features noted; and by the time the gas-works were reached, all the visitors must have been fully possessed by deep feelings of respect for the authorities who were their hosts.

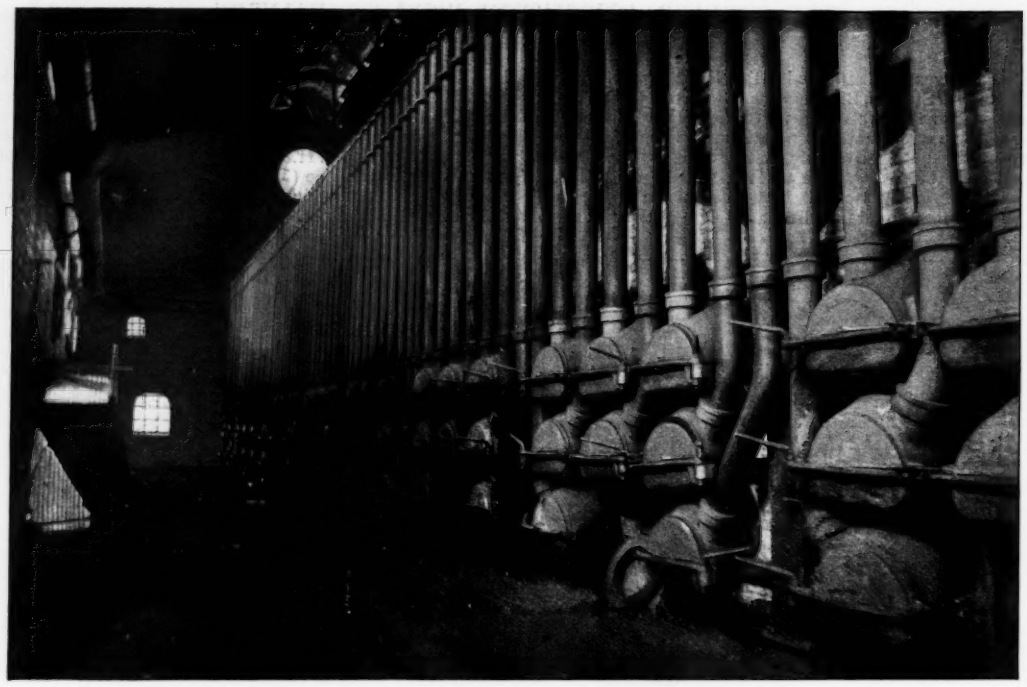


Fig. 3.—Inclined Retort-House—Discharging Stage.

At the Gas-Works.

Entering the gas-works, newness met the eye everywhere; and one looked about almost in vain among the manufacturing part of the plant for some vestige of a gas-making past. To look at the works, and the lamp-posts in the streets, the stranger might almost imagine that gas supply was a recent introduction in Malvern; but turning to the souvenir of the visit with which the members were presented, one learns that the governing authority were of the first in England to erect gas-works of their own. The print also furnished the following information about the gas undertaking.

In the year 1851, the then Improvement Commissioners obtained a Provisional Order, which empowered them to establish gas-works; and in 1858 a further Act of Parliament gave them additional powers, and enlarged the limits of supply. At that time no railway existed through Malvern; and the Commissioners, in their wisdom, decided to construct their works at the lowest point of their district, on its eastern boundary, and within three miles of the River Severn—all materials having, at that time, to be water borne. Until the winter of 1900, all the gas supplied to the Malvern district was manufactured at these works. In 1890, the quantity of gas made was 31,320,600 cubic feet, and in 1900 69,827,900 cubic feet showing that in the ten years the consumption had more than doubled. It may be of interest to state that for the year ended March 31 last, the make of gas was 114,068,100 cubic feet. Since April, 1898, 1483 cooking-stoves have been fixed; and 1086 prepayment meters. The total number of consumers in March last was 2669. The average charge for gas is 3s. 4d. per 1000 cubic feet.

In consequence of this abnormal demand, the works were unable to meet it without extensions; and it was contemplated to practically reconstruct on a larger scale on the old site. It should be mentioned here that the whole of the capital spent upon the undertaking had been repaid—the total outstanding debt at this period (1899) being a little more than £16,000, and this sum included the cost of the construction of a new holder in 1896, and something like £5000 for the extension of mains in the added districts of Malvern Wells, Poolbrook, and the

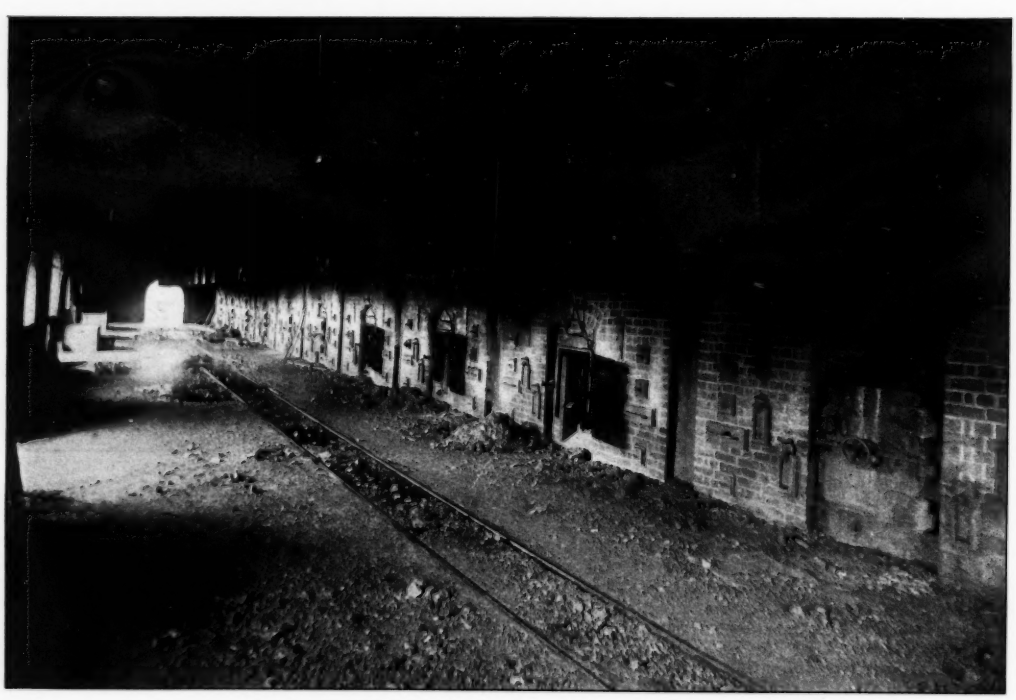


Fig. 4.—Retort-House, showing Clinkering Floor and Coke Tramway.

FIG. 5.—ENGINE AND EXHAUSTER ROOM.

Wyche, which districts had been amalgamated with that of the Council.

The Malvern works are some 1½ miles distant from the Station; and as the Severn had ceased to be a medium of conveyance after the railway was constructed, all material used in and produced from the manufacture of gas had to be carted from and to the station. This meant a charge of something like 1s. 6d. per ton upon the coal handled, in addition to which the wear and tear of highways was considerable.

In 1898, by an order of the Worcester County Council, the Urban District of Malvern Link was amalgamated for all purposes with the Malvern District. From 1861 and up to that period, the district of Malvern Link had been supplied with gas from a works owned by a private and non-statutory Company. The Company had established their works on the railway, and thus they had the advantage of a siding into them. The manufacture of gas in 1897 by the Company was about 13 million cubic feet. When the Malvern Council took over the Malvern Link district, they took over also the obligation which had been entered into by the Malvern Link Council to buy up the Malvern Link Gas Company. The purchase was effected; and the transfer took place on Jan. 2, 1899.

The producing power of both works was practically exhausted; and it was of the greatest importance that extensions should be made at the earliest possible moment to meet the demand for gas, which was a rapidly increasing one. The Engineer was therefore instructed to report upon the whole subject; and in April, 1899, the Council decided to adopt his recommendations, discarding the Malvern works for manufacturing purposes, using the site only as a storage and distributing station, constructing an entirely new works equal to a million cubic feet per day, upon the site of the works acquired from the Malvern Link Gas Company, utilizing as far as possible the old buildings already on the site, and as much of the manufacturing plant from the Malvern works as was suitable. In providing new works of this capacity, the Council have looked well in advance of present requirements, and it is not expected that any material additions will be required for, at least, ten years.

The site, from a railway point of view, is an ideal one. It is situated upon the Great Western main line from London to South Wales; and the yard level of the works is the same as that of the railway. The sidings from the main line into the works are laid at a suitable gradient, so that the trucks, when put off the trains at the south end, gravitate into the coal-store. As the holders were at the Malvern works, it was decided to connect them with the Link works by a 15-inch main; the length of this being 3566 yards. The Malvern works being much lower than the Malvern Link works, it is necessary to drive the gas (by means of exhausters) to the holders.

Having to start *de novo* with an entirely new retort-house, it was decided that the retorts should be on the inclined system. The house is 127 ft. long by 52 ft. wide by 48 ft. from ground floor to wall plate, and contains ten settings of eight retorts each, 20 ft. long, 21 in. by 16 in., tapering to 23 in. at the discharging mouthpieces, and set at an angle of 32°. Over the charging-stage, four coal storage hoppers are provided, each having a capacity of 17 tons 10 cwt. The charging-machines (six) are what are known as the Shoubridge type. After leaving the retorts, the coke falls through openings in the floor, and is conducted into upper waggons and quenched outside the house.

Adjacent to the retort-house, and on the railway side of same, a coal-store is provided with a capacity of about 2000 tons. The siding runs through the store and over the coal-breaking hoppers. Waggon-tipping, coal-breaking, and elevating plant is provided in duplicate. Part of the scheme, as originally set out, provided for the erection of a De Brouwer coke-conveyor. But subsequently this was eliminated from the specification; and in lieu thereof waggons, a narrow-gauge railway, hydraulic hoist, and sorting and storage plant were provided.

The whole of the building work, yard work, water, tar and liquor wells, mains, sidings, &c., has been carried out by the Council's workmen, directly employed. The contract for the retort-settings, coal-breaking plant, hoppers, &c., was placed in the hands of Messrs. W. J. Jenkins and Co., Limited, of Retford. The condensers, Livesey washer, purifiers, and coke storage plant were supplied and erected by Messrs. R. Dempster and Sons, of Elland. Other contractors were: Exhausters, Messrs. G. Waller and Co., of Stroud; station meter, Messrs. Parkinson and W. & B. Cowan, Limited, of Birmingham; sulphate of ammonia plant, Messrs. Goddard, Massey, and Warner, of Nottingham; "Eclipse" washer, Messrs. Newton, Chambers, and Co., of Sheffield; and railway weighing-machine, Messrs. Hodgson and Stead, Manchester.

The members were first conducted by Mr. Maybury into the coal-stores (fig. 1), where two trucks of coal were unloaded, in order to demonstrate to the members the working of the labour-saving system of unburthening the trucks. There are two underground coal-hoppers in the stores, which feed the coal-breakers at the foot of the elevators leading into the retort-house. At one end of each of the coal-hoppers is a steam-elevator, which engages with one of the axles of the truck, and uplifts it to a point at which the load of coal is shot into the hopper below. These steam-elevators work off the same engine as the coal elevating and conveying plant, by means of bevel gearing, with fast and loose pulleys, in duplicate. Going next into the retort-house (fig. 3), the visitors watched with interest the discharging of the three beds of inclines then working, and which are producing, under the present light conditions of working, about 300,000 cubic feet of gas per day. The retorts are just now only being worked at what may be described as a dull red heat; and the charges as they came sliding out (without assistance so far as could be seen on the discharging-floor) presented a well burnt-off appearance. Inquiry of Mr. Maybury elicited the information that North Wales coal is now being used; and that the weight of the charges is 6½ cwt. and over the producer 7 cwt. In the winter time, the ordinary charges are 7 cwt.; and over the producer 7½ cwt. The retorts have been working since last August Bank Holiday. The coke falls directly through openings in the floor (which, when discharging is not in progress, are covered by loose plates) into the coke-waggons below, which run on the narrow-gauge railway (fig. 4) leading to the hydraulic hoist and sorting, loading, and storage plant outside (fig. 2). Ascending to the charging-stage, the visitors witnessed the feeding of the retorts, by means of the Shoubridge charger and measuring chamber. Good even layers were the rule. In turn, the method of quenching the coke by means of a large spray close by the hydraulic hoist, and the subsequent raising and sorting of the coke were investigated, the gas-engine and exhauster room was visited, and the sulphate of ammonia plant was examined. The members spent a few spare minutes in wandering into other parts of the works; and among the minor features noticed were the spray baths provided for the men at the bottom of the water-tank tower. All sorts of sanitary and other conveniences are supplied for the men's comfort; and one could not inspect these various arrangements without feeling that the Malvern works are among the best

of similar establishments for men to comfortably pursue their labour in.

A Short Business Meeting—The Late Mr. Chester.

A few minutes were spent by the members in the purifying-house in transacting a little business. The President (Mr. Hunt) was first authorized to sign as correct the minutes of the last meeting held in Birmingham; and then, on the motion of the President, seconded by Mr. T. Berridge (Leamington), the following gentlemen were admitted as members: Mr. Fletcher W. Stevenson, of Coventry; Mr. William S. Morland, of Gloucester; Mr. Robert Hume Ainsworth, of Solihull; and Mr. Henry Fowler, the Chief Gas Engineer of the Midland Railway, Derby.

The President at this point said: Gentlemen, there is one more duty we have to perform, and I regret that it is of a very melancholy nature. You have all heard of the fatal termination of Mr. Chester's sad illness. Mr. Chester was a member of this Association. He was not often seen at our meetings; but he was known probably to all the members present as a very able and energetic member of the gas profession, I am sure you will feel it is incumbent upon us to pass a vote of condolence, expressive of our sincere sympathy with Mrs. Chester and her family in their great bereavement. I may say our Secretary has anticipated our wishes in this respect, and has conveyed to Mrs. Chester an expression of our sympathy. I will ask you now to approve of his action and the proposal I have made.

The members marked their acquiescence by a silent show of hands.

This was all the business; but, before remounting the brakes, the visitors were invited to take light refreshment.

Courtesy and a Luncheon—Mr. Hunt on a Recent Criticism.

The remainder of the day was spent in a continued run of pleasure. The second stage of the drive was to Madresfield Court, the residence of Earl Beauchamp, K.C.M.G., who had kindly thrown open his extensive grounds, and pleasure and fruit gardens to the inspection of the members. The beautiful mansion (partly old and partly modern), the ancient moat, the trim lawns, the well-cherished gardens, the trees of ages past, and many other things gave delight to all; and the visitors seemed loth to part from the beauty which surrounded them here on every hand.

The conveyances then quickly transported the party to the Imperial Hotel, at Great Malvern, where the Chairman and members of the District Council entertained their visitors to a magnificent luncheon. Dr. Dixey presided; and he soon proved that he possessed to the full those qualities which go to the making of an estimable chairman. After the lunch, he gave the members a very hearty welcome to the town, and expressed the hope that this would not be their last visit. Referring to the gas undertaking, he said he thought the Council could claim, without being accused of egotism, that the works were most compete, and worthy of a place like Malvern (The members could do nothing else but cordially endorse this view.) He also paid a very great compliment to Mr. Maybury, and referred to the considerable pressure under which he had to construct the new gas-works. For the first time Dr. Dixey informed the people of Malvern of how near they were in those days of having the town plunged in darkness, and of how it was only through their Engineer's fidelity and hard work that they escaped the calamity. He then proposed the toast of "The Midland Association of Gas Managers," and, coupling with it the name of Mr. Hunt, said he understood that that gentleman was the first President of the Association. He (Dr. Dixey) was glad to think that it fell to him to welcome Mr. Hunt to Malvern as President again 25 years after he first occupied the position.

We must report Mr. Hunt's response practically in full, as in it he adverted to the recent strictures passed by Mr. Livesey upon the technical organizations of the gas industry. Mr. Hunt said Dr. Dixey had mentioned in very kind terms the possible good that such an organization as the Midland Association could do; and he was sure, after the Doctor's long experience of municipal work, he must have felt the necessity for effective service on the part of the officers. It was effective service that an Association such as this sought to promote. They aimed at distributing professional knowledge by papers and discussions, and every member was invited to communicate his ideas and experience to his fellow members. The members also relied upon object-lessons such as those they had had that day. They learnt more from the experience of those who had had to construct works than perhaps by any other means. And here he could not refrain from congratulating the Chairman and the members of the District Council on the excellent and admirable works they had been able to show the Association that day. They reflected the highest credit on the Engineer; and he (the President) had not the slightest doubt that they would give satisfaction and be a source of profit to the district. The Association he regarded very much as a child of his own. He was present at its birth; he assisted its infant footsteps; and he had had the satisfaction of seeing it attain a healthy and vigorous manhood. There were others in the room who were also at the first meeting, at which there were only ten members present. Now the Association numbered 100 members; and they were spread over a large area of the country. He knew that it had been said recently by a very high authority—Mr. George Livesey—that Associations such as this did but very little good beyond promoting social intercourse. If they did only that amount of good, he (Mr. Hunt) thought they were well worth promoting and encouraging, because it was by communication with one's fellow members of the profession that one learnt and improved; and gas managers were peculiarly isolated in the pursuit of their vocations. He thought, however, that Mr. Livesey's criticism was directed, or rather was prompted, by a feeling of disappointment that the two principal organizations of the kind were not in a position to carry on the work that he had at the present time most at heart. He (the President) thought they might accept the criticism as rather a stimulus to do better in the future than in the past, if that were possible. Satisfaction with one's progress was never desirable. It certainly did not promote success; and he thought they should take the criticism to heart, and aim at a greater amount of usefulness in the future. Then Mr. Livesey's utterances would not have proved in vain. He was sure from what he knew of this Association that the good work that had already been done would be carried on. Personally, he might not be able to take such an active part in the work in the future as he had in the past; but he had no fear for its future so long as they had so many good workers among the members.

Mr. R. O. Paterson next gave "The Malvern District Council." The Chairman of the Gas and Water Committee (Mr. F. A. Moerschell) responded; and he also said many kind things of the Engineer. The toast of "The Chairman" was confided to the Vice-President (Mr. C. Meiklejohn); and the visitors drank to it very enthusiastically. Dr. Dixey's acknowledgment ended the festive gathering.

Before quitting the grounds of the hotel, the whole party were photographed, as the Chairman had expressed a wish to have a pictorial record of the event.

The Malvern Hills.

Again boarding their conveyances, the large company were driven through the really perfect panorama of glorious and ever-changing scenery which surrounds the range of hills that have had a large part in making Malvern famous. The great declines and inclines down and up which he has to supply gas and water were pointed out by Mr. Maybury; and it was apparent to the members that he has no small difficulties to contend with in his distribution of these necessities. He has for example 1200 street-lamps placed in vast depressions and at high altitudes; and where there are these lamps, there are houses all requiring water and most of them gas. At one point the visitors were 200 feet above sea-level; and on and on they went meeting with houses at 800 and 900 feet above sea-level. Multifarious are the schemes and dodges which have to be resorted to to keep them properly served in both respects. Up one long hill he pointed out there are two gas-governers; and yet at the top of the hill he is able at one lamp-post to register a pressure of about 6 inches. This and many other points of professional interest were gathered on the journey; and the while the members were feasting their eyes on some of Nature's most beautiful work.

At the British Camp Hotel, high up in the hills, the members were entertained to a refreshing tea by Mr. and Mrs. Maybury, who were both very sincerely thanked for their generous hospitality. The members also expressed, with due heartiness, their appreciation of the courtesy of Earl Beauchamp, and of the kindness of all who had contributed to the day's enjoyment. The return journey to Malvern Station by another route was quickly made; and about seven o'clock, the visitors departed from the town, carrying with them the brightest of impressions of the "Queen of Inland Health Resorts," and of her people.

ANALYTICAL VALUATION OF GAS COALS.

At the Meeting of the Institution of Mining Engineers in London last week, the above subject was dealt with in a paper submitted by Mr. G. P. Lishman, B.Sc. (Edin.), F.I.C. We have received from the Secretary of the Institution (Mr. M. Walton Brown) a print of the paper, from which we take the following particulars.

In his introductory remarks, the author pointed out that in the seventeenth and eighteenth centuries destructive distillation was the commonest process in use in chemical laboratories. As regards coal the first recorded quantitative experiment was made by Stephen Hales, who, in 1726, obtained from 158 grains of pit-coal 180 cubic inches of gas, or equal to a yield of 10,340 cubic feet per ton—probably a very accurate result. It was about the beginning of the nineteenth century that gas lighting began to be introduced into this country; and no doubt gas makers would, at an early stage, develop methods of distinguishing between good and bad coal. From the fact, however, that there is an almost total absence in scientific journals of papers on the testing of gas coal, the author thinks it may be gathered that the subject had been somewhat neglected, no doubt owing to the considerable expense involved. The effect had been that, though coal-testing plants are now attached to most gas-works, the engineer still has to rely mainly on the results obtained on a working scale. These, expressed in cubic feet per ton and in candle

power, come out most irregularly, and very considerable differences are found between one test and the next.

Proceeding to consider the nature of the difficulties attending the testing of gas coal in experimental plants, the author says the main cause may be summed up in the word "temperature;" and in this respect a small apparatus is much more readily affected by external conditions than a large one. In a works where there are many retorts, irregular gas coming from one quarter will be compensated for by that from another and "corrected" by this means, so that the result is a more or less uniform product from day to day. Very slight variations of temperature in the condensers may make a considerable difference in the quality of the gas produced; and if this can be overcome, the difficulty is ended from the point of view of the gas engineer, who has only himself to consider. It does not matter to him whether the results from the testing plant are higher or lower (within limits) than those obtained in the works, so long as they are reliably comparative. This is the desideratum, which, so far, has been so difficult to obtain by any method which may reasonably be called a laboratory one. The analytical chemist, however, is confronted with the further difficulty, that from the same coal a better result will be obtained in one gas-works than in another; this discrepancy being caused both by differences of efficiency in the plant used and the personal equation of the engineers. It is now generally considered that the results of testing gas coal should be reported in terms of what could be obtained from the coal by a capable gas engineer using an efficient manufacturing plant.

The difficulties above alluded to fall naturally under two heads: (1) Those connected with the temperature of the retorts and of the condensers; and (2) that due to the difference of results found in the various gas-works. Keeping these in view, various methods were tried at Lambton for overcoming them, and for finding a means of testing gas-coals on the laboratory scale. The experiments extended over twelve months; and though failing in their primary object (or rather showing that it was unattainable), were of value as indicating two points: (1) That in any apparatus designed for testing coal, the amount of condensation must be capable of very considerable variation; and (2) that in successive tests of the same coal, the results are more constant when the condensation is rather heavy.

The author points out that in considering the design of a coal-testing plant, it is necessary to bear in mind that it is not possible to make it a model of a full-sized gas-works, as no two works are alike. At the same time, the same broad outlines—consisting of the retort, ascension-pipe, condensers, preferably a scrubber, purifiers, and gasholders—must be retained. A sufficient quantity of coal to make at least 8 cubic feet of gas, must be employed, as this is the least quantity with which the illuminating-power can be satisfactorily taken. By using a standard coal, to correct for varied condensation, the necessity for adhering rigidly to one particular form of apparatus is dispensed with; but certain essentials cannot be neglected, particularly when work is to be done in all weathers. These may be stated as follows: (1) The condensers must be much larger, in comparison to the retort, than those used in gas-works. They must be water-jacketed for cooling in summer, and so arranged that they may be bye-passed in sections. (2) The purifying area must also be larger, in comparison with the retort, than is the case in gas-works, so that in a considerable series of tests approximately the same conditions as to purification may obtain throughout. (3) Two gasholders, conveniently of 15 cubic feet capacity, must be in use, so that tests may follow each other immediately, and the temperature of the retort thus maintained the same during each experiment. (4) The whole arrangement must be indoors, and in summer the heat from the retort must be kept from the rest of the plant. (5) A good photometer and spacious photometer-room are also necessary. [The general arrangement of the plant used at Lambton was shown on a plate attached to the paper.]

The following are the routine details of a test: One-thousandth part of a ton, or 2·24 lbs. of coal has been found a convenient and sufficient quantity to take for a test. About 10 cubic feet of gas are obtained, which is ample for taking the illuminating power; but if the coal gives a poor yield, a larger quantity may be used. The coal is charged into the red-hot retort in a sheet-iron box, 14 in. by 4½ in. by 2 in., and the door, carrying its fire-clay luting, screwed tight. The tap at the entrance of the gasholder is then immediately opened. In from 60 to 90 minutes, the gas will have ceased to come off; the volume is then measured, and the retort discharged. The gas is next passed into the other holder, being thus properly mixed, and on to the photometer to be burnt there. The retort is at once ready for the succeeding charge, which is worked into the first holder as before; the illuminating power of the gas from the previous test being taken in the meantime.

Having seen that it was not by any particular form of apparatus alone that gas coals could be satisfactorily valued, and as it was undesirable for statements as to their quality to vary on account of the season of the year in which the tests were made, it became evident that some correction must be applied to the results actually obtained, before they could be accepted as the true ones. This correction was found by using a coal of known value. At the Lambton Collieries there exists a seam which, within a certain area, is very fairly constant in quality, and the sperm value is fixed at a figure obtainable from it at any of the best gas-works. It is stored in small stocks at a time at the laboratories, so as to be always fresh.

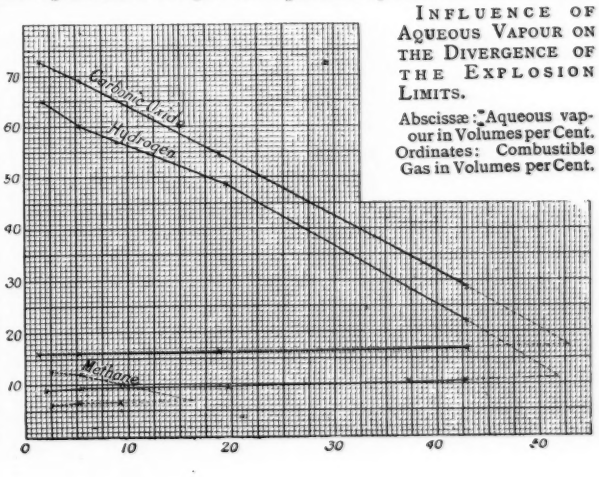
In testing an unknown coal, two blank charges are first worked through the apparatus. The volume of gas obtained from these may be noted; but this gas is burnt at the photometer without being tested—these preliminary charges being made merely to get the apparatus full of ordinary "end gas" or "last runnings." Three consecutive tests are then made: (1) Of the coal to be tested, (2) of the standard coal, and (3) of the coal to be tested; the yield being noted and the illuminating power taken in each case. From these, the sperm value is calculated. Working in this manner, it is ascertained every day what a coal of known quality is doing, and the unknown is corrected proportionately. On a frosty day, for example, when condensation is unavoidably severe, condensers are short-circuited, but still the sperm values come out as low as perhaps 490 lbs or 500 lbs. per ton from good coal—the standard being also affected in the same manner; and this coal, which in August would give a sperm value of 600 lbs. per ton, will now give only 520 lbs. The value which can be got out of it in first-class works is (say) 580 lbs. Therefore the value of the unknown coal is found by proportion: As 520 : 580 :: 495: to the corrected sperm value in pounds per ton. Consequently, when it is said that a coal has given in a testing plant results equal to "10,000 cubic feet of 16-candle gas"—that is, a sperm value of 548 lbs. per ton—the statement as it stands is flexible, and this 548 lbs., while actually, and possibly regularly, obtained, may really require to be corrected down to 500 lbs. before arriving at a figure which could be got from the coal at any gas-works in the country.

Summing up the advantages of his system, the author says it considerably minimizes the difficulties due to variable condensation; it is less difficult to keep the retort temperature constant for one day than to maintain it at the same temperature on different days; the analyst's difficulty, caused by the variety of results from the same coal in different gas-works, is largely overcome, because the standard coal is fixed at a sperm value which can be obtained from it at the best works, and all corrected results are statements of what can be procured from the coal at such works; and, lastly, the method permits of the alteration of the form of the apparatus from time to time as improvements may be suggested, as these alterations only affect the uncorrected results. By means of proper condensation, the use of a coal seam as a standard, and careful attention to the heat of the retort, gas coals can be somewhat finely discriminated by a laboratory method; and the use of a standard coal is regarded as absolutely essential to success.

EXPLOSIVE LIMITS OF COMBUSTIBLE GASES.

(*Concluded from p.* 1420).

PART III.—*Explosion of Combustible Gases with Mixtures of Air and Aqueous Vapour.*—These experiments presented a difficulty in that they had to be made at higher temperatures, which were constant and known, in order that larger amounts of aqueous vapour might be added to the mixtures. The explosion burette was provided with a glass jacket, with inlet and outlet connections, by means of which the annular space between the burette and the jacket could be traversed by a rapid stream of the vapour of some liquid of constant boiling point, which would be condensed after it had left the jacket. The liquids used were ether, carbon bisulphide, chloroform, and alcohol. A thermometer was inserted in the vapour jacket against the burette. It was thus possible to secure, and keep constant, the desired temperatures. The experiments were made over mercury, but with sufficient water in the burette to saturate the gas with aqueous vapour at the temperature employed. A determined volume of the mixture of gas and air of known composition was admitted to the wetted burette, which was then heated by means of the vapour jacket until all the conditions had become constant. The temperature was read off; and the difference of pressure due to the expansion of the gas was equalized by means of the levelling



INFLUENCE OF AQUEOUS VAPOUR ON THE DIVERGENCE OF THE EXPLOSION LIMITS.

Abscissæ: Aqueous vapour in Volumes per Cent.
Ordinates: Combustible Gas in Volumes per Cent.

TABLE III.

Combustible Gases with Mixtures of Air and Aqueous Vapour.

Combustible Gas. With (t) Temperature, (b) Pressure, and (a) Tension of Aqueous Vapour.	Percentage in the Mixture (ignoring Aqueous Vapour) of		Percentage in the Mixture of			Remarks.
	Combustible Gas.	Air.	Combustible Gas.	Air.	Aqueous Vapour.	
Hydrogen:	9·4	90·6	9·2	88·9	1·9	No explosion
t = 17·0° C	9·5	90·5	9·3	88·8	1·9	Explosive range
b = 756 mm.	66·3	33·7	65·0	33·1	1 9	
a = 14·4 mm.	66·5	33·5	65·2	32·9	1·9	No explosion
,,	9·5	90·5	9·0	85·7	5·3	,, ,,
t = 34·5° C.	9·8	90·2	9·3	85·4	5·3	Explosive range
b = 771·6 mm.	63·5	36·5	60·1	34·6	5·3	
a = 40·6 mm.	63·8	36·2	60·4	34·3	5·3	No explosion
,,	11·7	88·3	9·4	70·8	19·8	,, ,,
t = 60·5° C.	12·0	88·0	9·6	70·6	19·8	Explosive range
b = 771·6 mm.	61·0	39·0	48·9	31·3	19·8	
a = 152·4 mm.	61·4	38·6	49·2	31·0	19·8	No explosion
,,	19·2	80·8	11·0	46·3	42·7	,, ,,
t = 78·1° C.	19·6	80·4	11·2	46·1	42·7	Explosive range
b = 765·6 mm.	38·2	61·8	21·9	35 4	42·7	
a = 328·4 mm.	38·8	61·2	22·2	35·1	42·7	No explosion
Carbonic Oxide:	16·0	84·0	15·7	82·7	1·6	No explosion
t = 14·0° C.	16·4	83·6	16·1	82·3	1·6	Explosive range
b = 764·6 mm.	74·0	26·0	72·8	25·6	1·6	
a = 11·9 mm.	74·3	25 7	73·1	25·3	1·6	No explosion
,,	16·7	83·3	15·8	78·9	5 3	,, ,,
t = 34·5° C.	17·0	83·0	16·1	78·6	5 3	Explosive range
b = 764·6 mm.	73·4	26 6	69·5	25·2	5·3	
a = 40·6 mm.	73·6	26·4	69·7	25·0	5·3	No explosion
,,	19·8	80 2	16·1	65·0	18·9	,, ,,
t = 60·5° C.	20·1	79·9	16·3	64·8	18·9	Explosive range
b = 767·6 mm.	68·2	31 8	55·3	25·8	18·9	
a = 152·4 mm.	68·6	31·4	55·8	25·3	18 9	No explosion
,,	29·2	70·8	16·6	40·4	43·0	,, ,,
t = 78·1° C.	29·6	70·4	16·9	40·1	43·0	Explosive range
b = 764·6 mm.	50·2	49·8	28 6	28·4	43·0	
a = 328·4	50·6	49·4	28·8	28 2	43·0	No explosion
Marsh Gas:	6·0	94·0	5·9	91·8	2·3	No explosion
t = 20·0° C.	6·2	93·8	6·1	91·6	2·3	Explosive range
b = 725 mm.	12·7	87·3	12·4	85·3	2·3	
a = 17·4 mm.	12·9	87·1	12·6	85·1	2 3	No explosion
,,	6·7	93·3	6·3	88·4	5·3	,, ,,
t = 34·5° C.	6·9	93·1	6·5	88·2	5·3	Explosive range
b = 768·6 mm.	12·4	87·6	11·7	83·0	5·3	
a = 40·6 mm.	12·7	87·3	12·0	82·7	5·3	No explosion
,,	7·0	93·0	6·3	84·3	9·4	,, ,,
t = 45° C.	7·3	92·7	6·6	84·0	9·4	Explosive range
b = 762·6 mm.	11·1	88·9	10·1	80·5	9·4	
a = 71·4 mm.	11·4	88·6	10·3	80·3	9·4	No explosion

vessel. For the rest, the procedure was as in the previous explosion experiments.

In this manner, the gaseous mixtures were investigated, saturated with aqueous vapour at the temperature of the room, and at 34·5° C. (94·1° Fahr.), 45·0° C. (113° Fahr.), 60·5° C. (140·9° Fahr.), and 78·1° C. (172·6° Fahr.), which temperatures correspond with the boiling points of the liquids used. The results obtained are summarized in Table III. Regnault's determinations of the tension of aqueous vapour were taken for the data required. The results have also been plotted on a diagram (p. 1493). Owing to the time occupied by these difficult experiments, they were limited to hydrogen, carbonic oxide, and marsh gas, as it appeared from the diagram that the delimiting lines of the field or range of explosibility would again be straight. The results are to be regarded from the same standpoint as those of the earlier series, and the same general deductions apply. They furnish further proof of the general applicability of Le Chatelier's law, already referred to.

PART IV.—*Explosion of Detonating Gas with Sundry Gases.*—The discussion of the results of the first three series of experiments required the gaseous constituents of the mixtures to be grouped so that each inert gas appeared placed with a certain fixed percentage of "air-detonating-gas," which appertained to it, and sufficed for direct combustion. This method of presenting the results should have admitted of the amounts of "air-detonating-gas" required by each of the inert gases in question to produce a combustible mixture being calculated. But the experimental material did not suffice for this; and it appeared, therefore, desirable to submit these relations to direct experiment. In order that the values obtained might be as far as possible generally applicable, "theoretical detonating gas," or a mixture of the combustible gas with the quantity of oxygen exactly requisite for its combustion, was investigated, instead of "air-detonating gas." The experiments were made by diluting it in turn with oxygen, nitrogen, and carbonic acid. The detonating gas used was measured and stored in calibrated glass cylinders over mercury; and its composition was checked by analysis before and after each series of tests. The explosions were made over mercury; and the gases were saturated with aqueous vapour by the presence of a few drops of water. The results are summarized in Table IV.

The earlier researches had dealt with mixtures in which air or "carbonic-acid-air" was always present; and the present series was undertaken with the object of studying the action of any one inert gas by itself in displacing the explosive limits. The results

TABLE IV.

*Explosion of Mixtures of Various Forms of "Detonating Gas" with Various Diluents.**

Nature of "Detonating Gas" and Percentage of Aqueous Vapour Present."		Diluents.					
		Oxygen.		Nitrogen.		Carbonic Acid.	
		x.	y.	x.	y.	x.	y.
Hydrogen	(a)	14·0	13·7	19·3	19·0	31·2	30·8
1·8	(b)	86·0	86·3	80 7	81·0	68·8	69·2
Carbonic oxide . .	(a)	23·6	23·2	25·8	25·4	35·6	35·0
2·0	(b)	76·4	76 8	74·2	74·6	64·4	65·0
Marsh gas	(a)	19·6	19·0	23·5	23·1	32·1	31·6
1·8	(b)	80·4	81·0	76·5	76·9	67·9	68·4
Ethylene	(a)	15·6	15·2	18·7	18·2	22·3	21·9
1·9	(b)	84·4	84·8	81·3	81·8	77·7	78·1
Acetylene	(a)	11·1	10·6	13·2	12·7	18·9	18·5
2·0	(b)	88·9	89·4	86 8	87·3	81·1	81 5

* Percentage in the mixture (a) of detonating gas, (b) of diluent gas, x. when the mixture is combustible, y. when the mixture is no longer combustible.

ought to connect the separate series of researches of this section with one another. It was presumed that the explosive limits—*e.g.*, the lower limit—of a gas in admixture with any inert gas could be calculated if it were known how much detonating gas each inert gas needed to form a combustible mixture. This presumption, however, has proved to be wrong. For example, from Table IV. it may be calculated that 1 c.c. of hydrogen requires 0·1017c.c. of hydrogen to form an explosive mixture at the limit of explosiveness, and that 1 c.c. of nitrogen requires 0·2369 c.c., and 1 c.c. of carbonic acid requires 0·4493 c.c., of detonating gas to become combustible. From these data, the limit of explosiveness of hydrogen in admixture with air is found by the following calculation: 79 volumes of nitrogen require 18·72 volumes of detonating gas, consisting of 12·48 volumes of hydrogen and 6·24 volumes of oxygen. Of the 21 volumes of oxygen, 21 − 6·24 = 14·76 have to be compounded with 1·50 volumes of hydrogen. Therefore, to 100 volumes of air there must be added 12·48 + 1·50 = 13·98 volumes of hydrogen. So that the 113·98 volumes of the mixture of hydrogen and air at the limit of explosiveness show a percentage of 12·27 of hydrogen and 87·73 of air. But it was found by direct experiment that 9·45 per cent. of hydrogen formed the explosive mixture. The divergence of 2·83 in the percentage of hydrogen far exceeds any possible experimental error.

Similarly it may be calculated that the limit of explosiveness should be 13·60 per cent. of hydrogen with a mixture of equal parts of air and "carbonic-acid-air;" while 12·70 was found by direct experiment. The difference again is greater than an error of experiment. The limit of explosiveness of carbonic oxide in admixture with air should be by calculation, 16·85; while experiment gave 16·50 per cent. For marsh gas admixed with air, calculation gave 7·7, and experiment 6·1 per cent. The difference in this case also far exceeds the experimental error.

The cause of the deviations, of which these are examples, may be elucidated by reference to the researches of Emich. He showed that the inflammability of thin layers of detonating gas increased on diluting the gas with oxygen, until the ratio of the volume of hydrogen to that of oxygen had become = 1. This was explained on the supposition that the increase of oxygen was attended by an increase in the number of impacts on one another of the molecules of hydrogen and oxygen, and a consequent greater opportunity for the occurrence of the reaction. As this mechanical explanation agrees with Emich's observation, it can be employed to clear up the aforementioned differences. For it is then not immaterial whether excess of oxygen is or is not present in addition to the inert gas and detonating gas. In the first case the explosion limit will be lower than in the second.

In the researches on mixtures of pure detonating gases and inert gases, only the requisite quantity of oxygen for the complete combustion of the combustible gas has been present. But excess of oxygen was present when the lower limits of explosiveness were determined for mixtures of combustible gases with air, &c. It is therefore obvious that, with this difference in the proportions, the results of the detonating gas experiments are not forthwith comparable with those of the other series. The values for the explosion limits calculated from the detonating gas experiments must lie higher than those found directly by the researches; and the differences must be greater the greater the excess of oxygen present in the mixture. This is clear from the above calculations. The calculated values lie higher than those experimentally found; and the deviations at the explosion limits of the mixtures with air are greater than those of the mixtures with "carbonic-acid-air." It appears, therefore, to be generally right that excess of oxygen in an explosive mixture raises its inflammability, and thus extends the limits of explosiveness downwards.

The theoretical treatment of the question as to what the explosive limits of combustible gases and vapours depend on in general, is advanced a step further by this knowledge. The experimental material does not, however, suffice, to establish the law according to which oxygen influences the explosion limits, and according to which the behaviour of the different gases is controlled in view of this influence. The determination of these relations must remain for later researches; and it appears not impossible that the explosion limits will ultimately be traced back to the chemical and physical constants of the gases.

IMPERIAL CONTINENTAL GAS ASSOCIATION, MARIENDORF (BERLIN) WORKS.

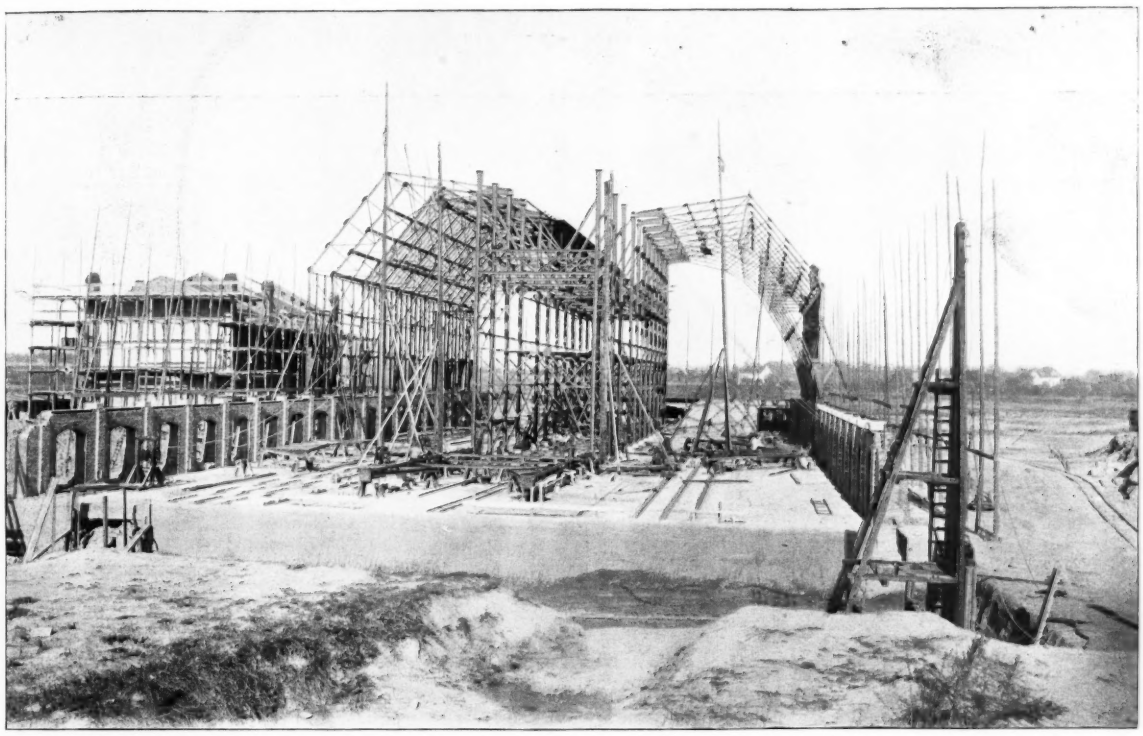


FIG. 5.—RETORT-HOUSE IN COURSE OF CONSTRUCTION (OCT. 9, 1900) SHOWING STOKERS' MESS ROOM AND BATHS AT SIDE.

FIG. 6.—RETORT-HOUSE IN ACTION (APRIL 22, 1902), SHOWING ELEVATED TANKS FOR TAR, AMMONIACAL LIQUOR, ANTHRACENE OIL, AND CYANOGEN SLUDGE; ALSO COKE BREAKERS.

IMPERIAL CONTINENTAL GAS ASSOCIATION, MARIENDORF (BERLIN) WORKS.

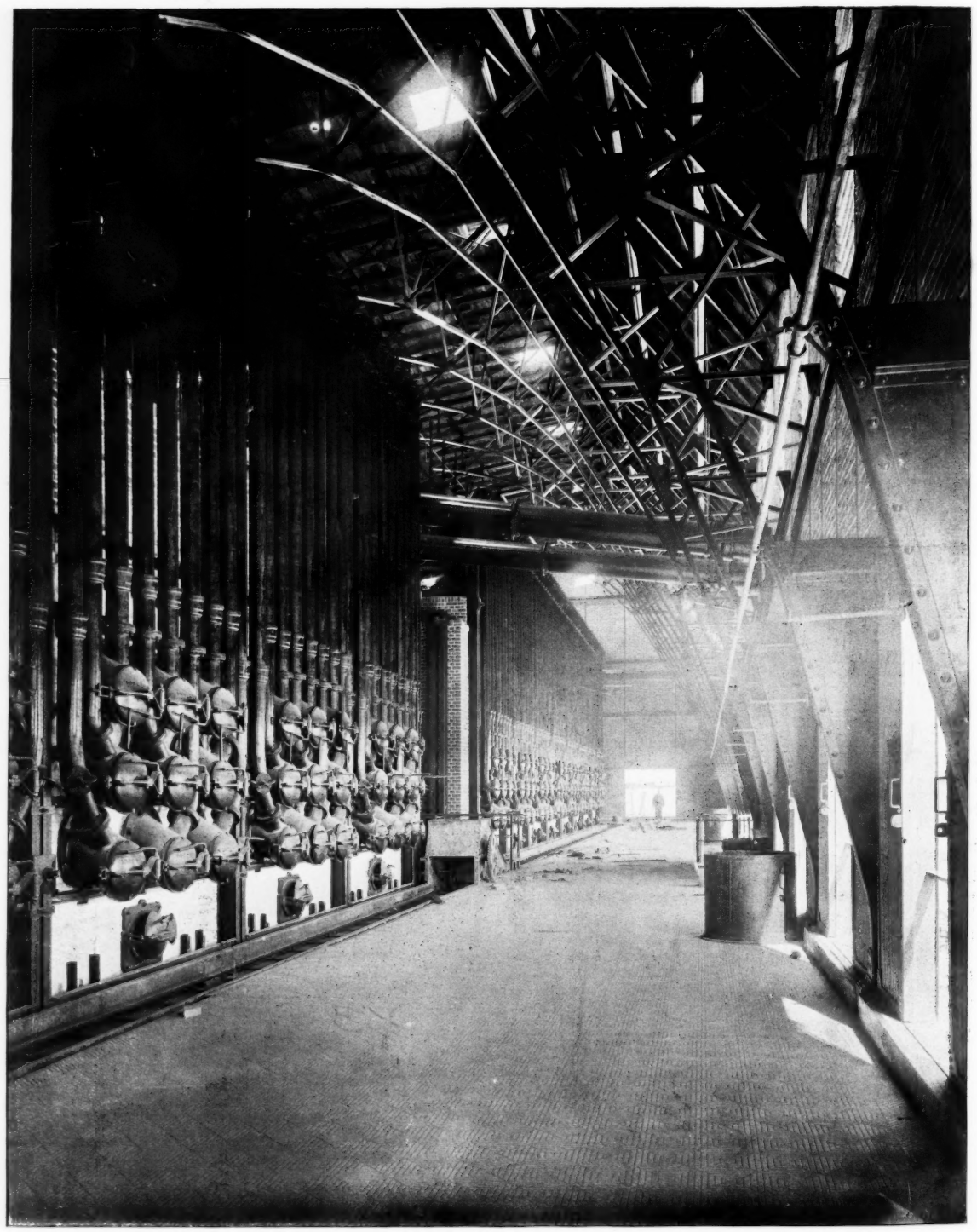


FIG. 7.—INTERIOR OF RETORT-HOUSE, EAST SIDE OF DISCHARGING FLOOR (SEPT. 8, 1901).

IMPERIAL CONTINENTAL GAS ASSOCIATION, GITSCHINER STRASSE (BERLIN) WORKS.

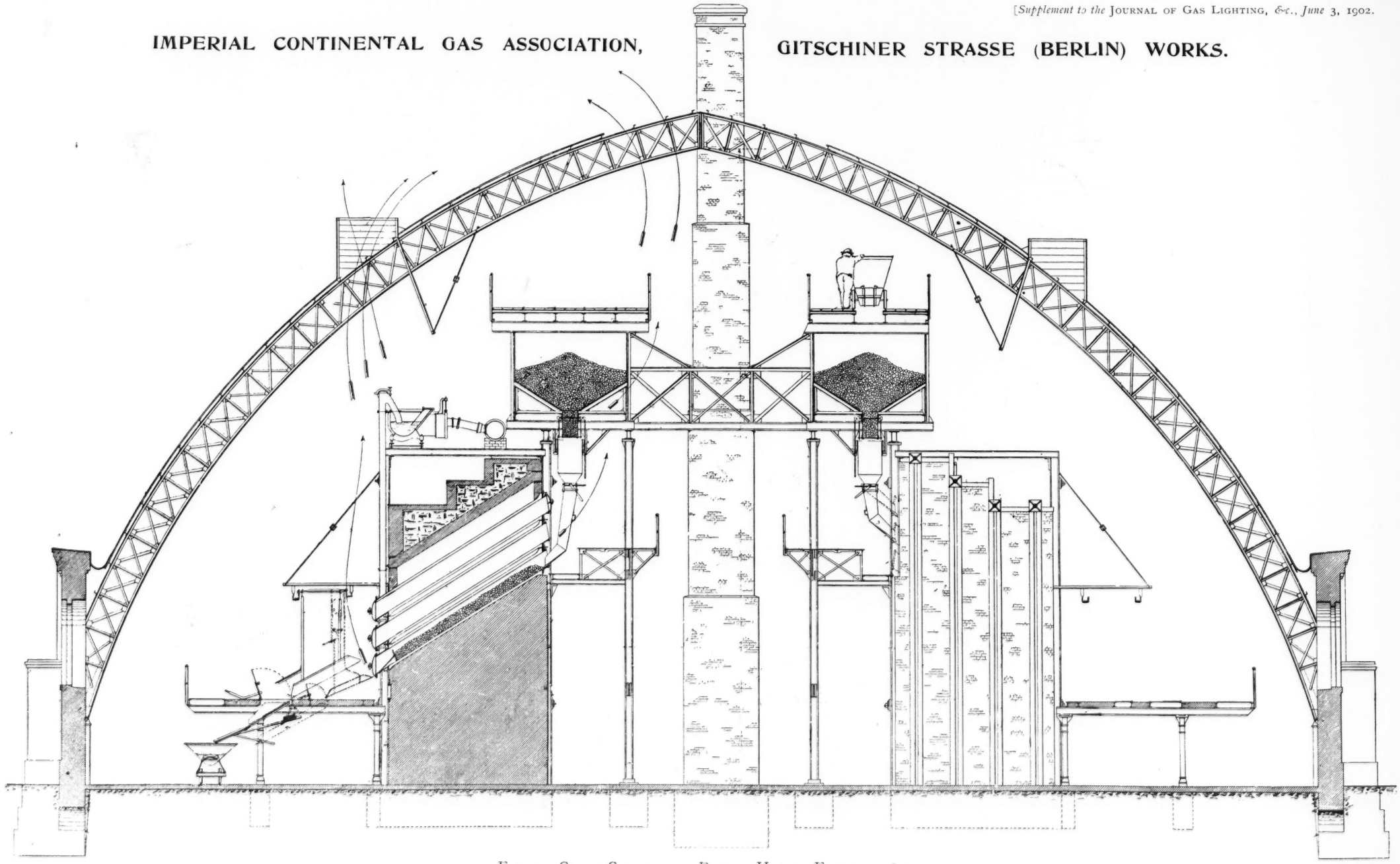


FIG. 2.—CROSS SECTION OF RETORT-HOUSE, ERECTED 1892.

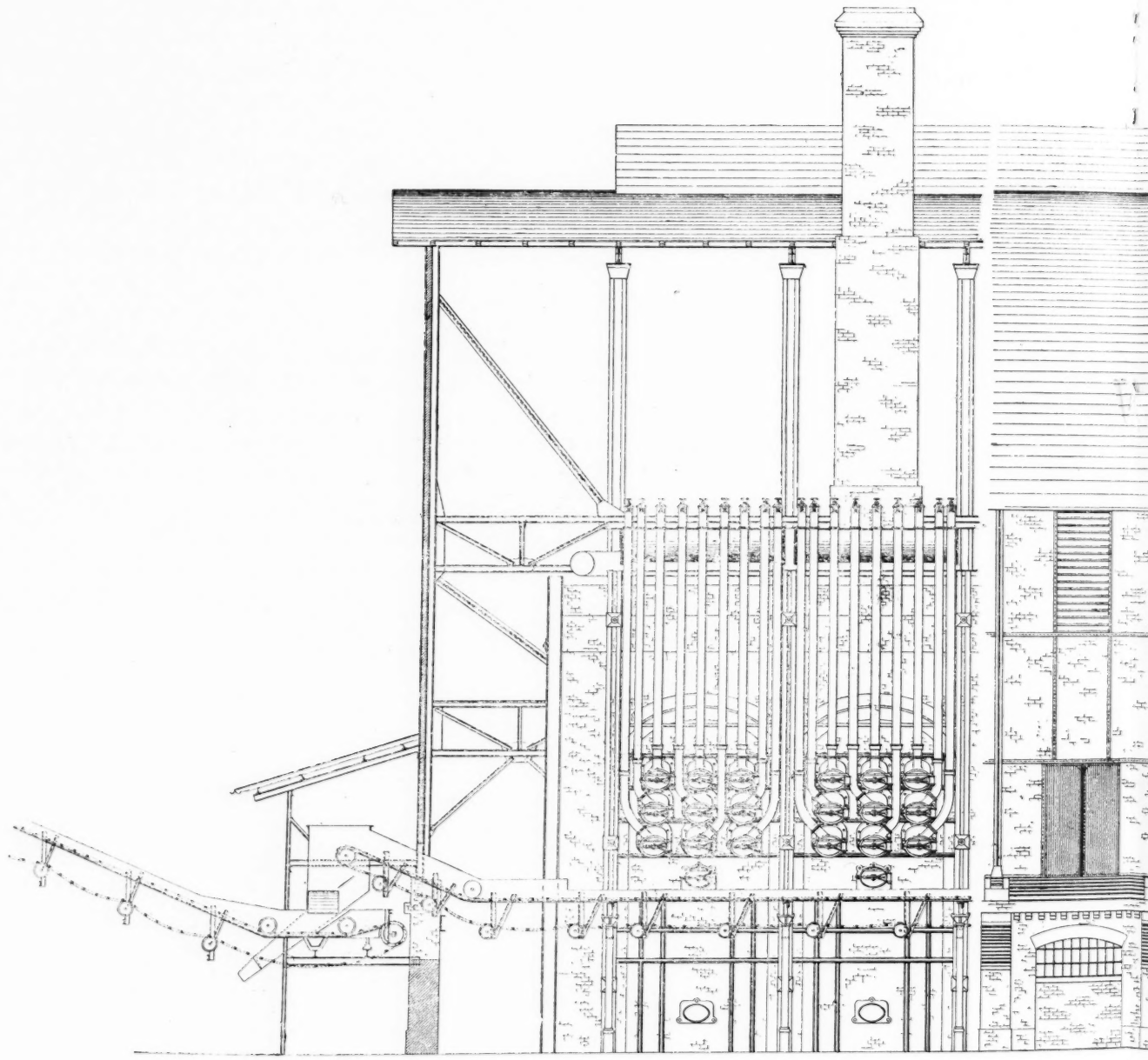
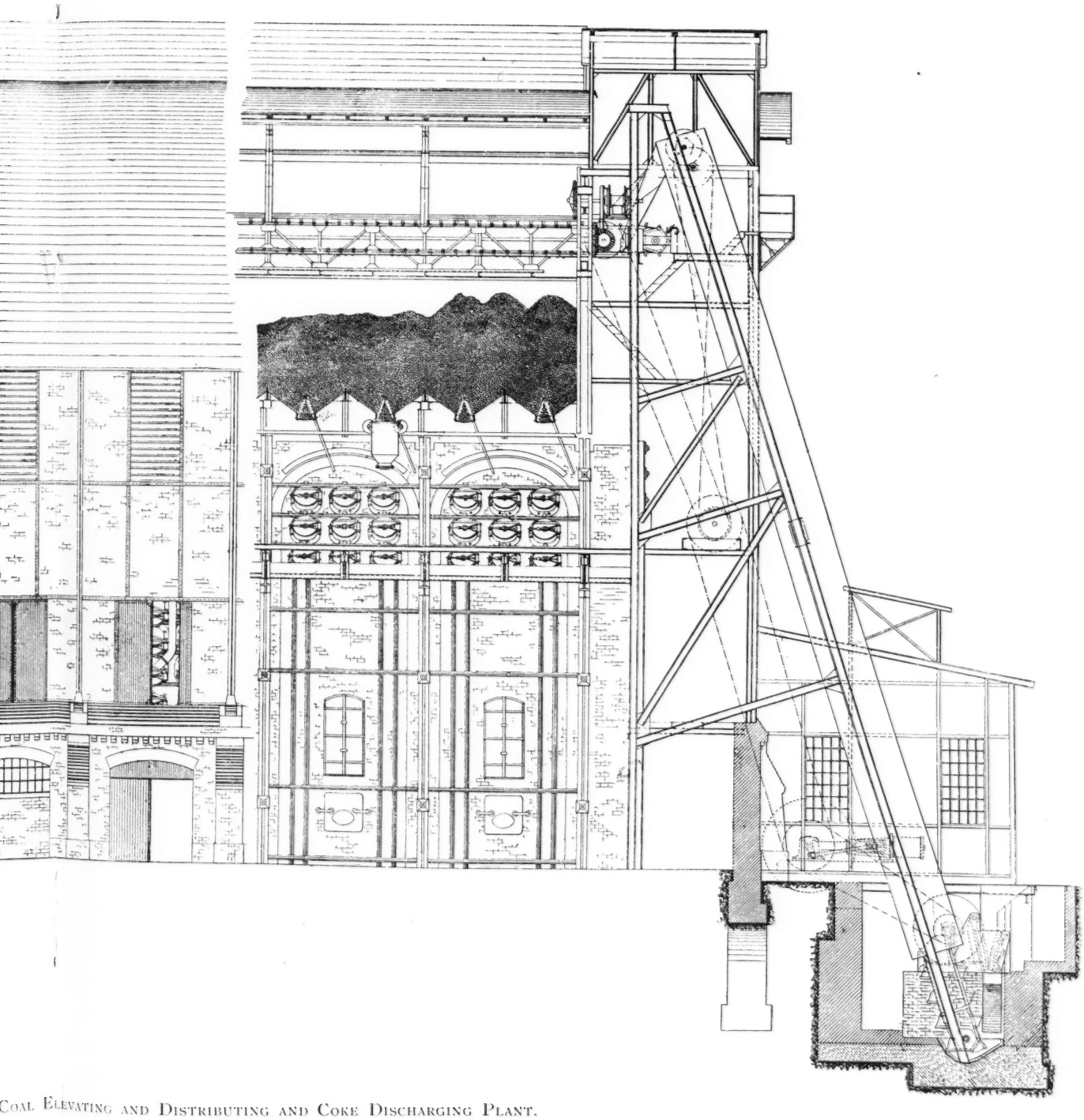


FIG. 3.—RETORT-HOUSE ERECTED 1901, SHOWING COAL ELEV

SOCIATION, MARIENDORF (BERLIN) WORKS.



COAL ELEVATING AND DISTRIBUTING AND COKE DISCHARGING PLANT.

IMPERIAL CONTINENTAL GAS ASSOCIATION. MARIENDORF (BERLIN) WORKS.

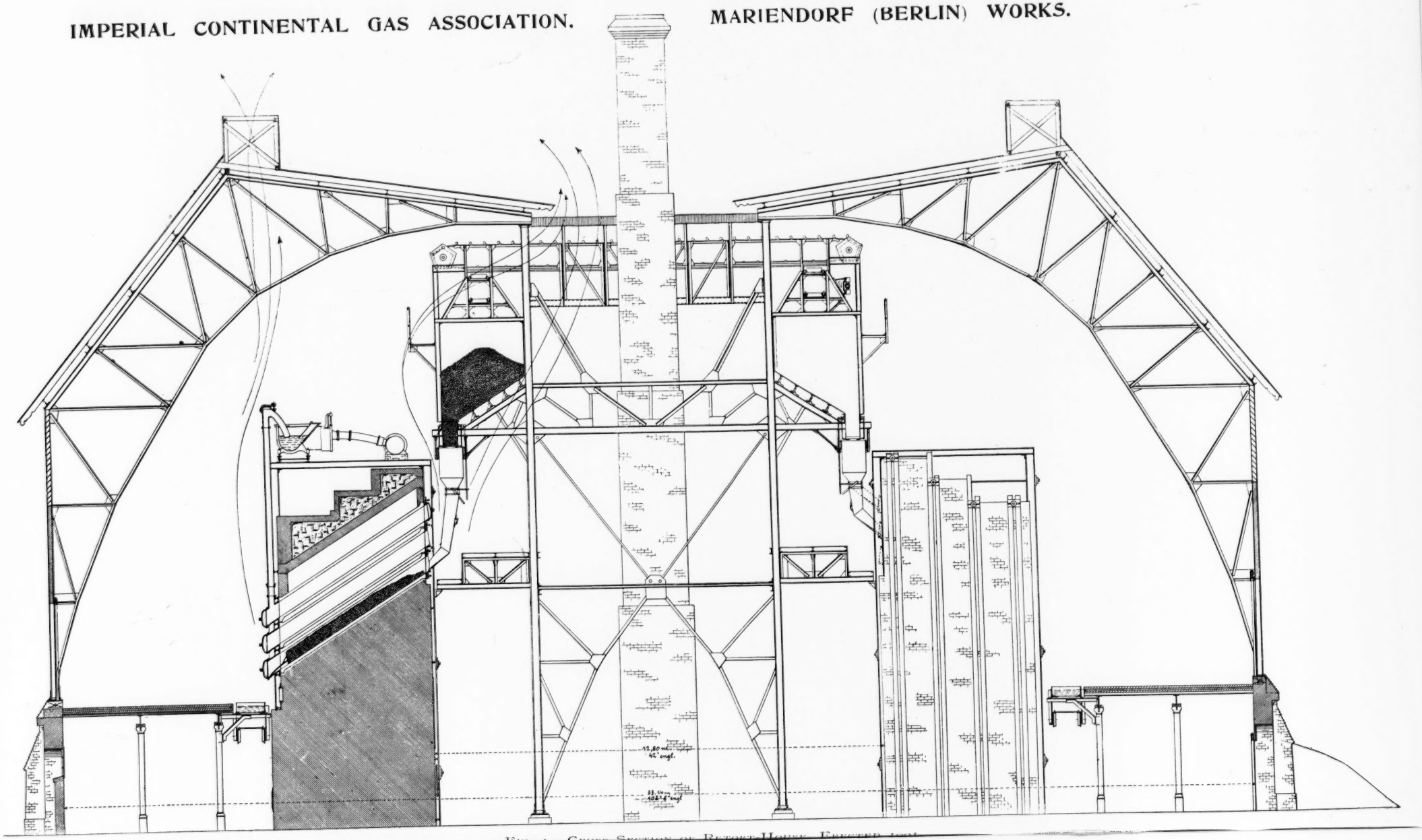


FIG. 1.—CROSS SECTION OF RETORT HOUSE, ERECTED 1901.

IMPERIAL CONTINENTAL GAS ASSOCIATION, MARIENDORF (BERLIN) WORKS.

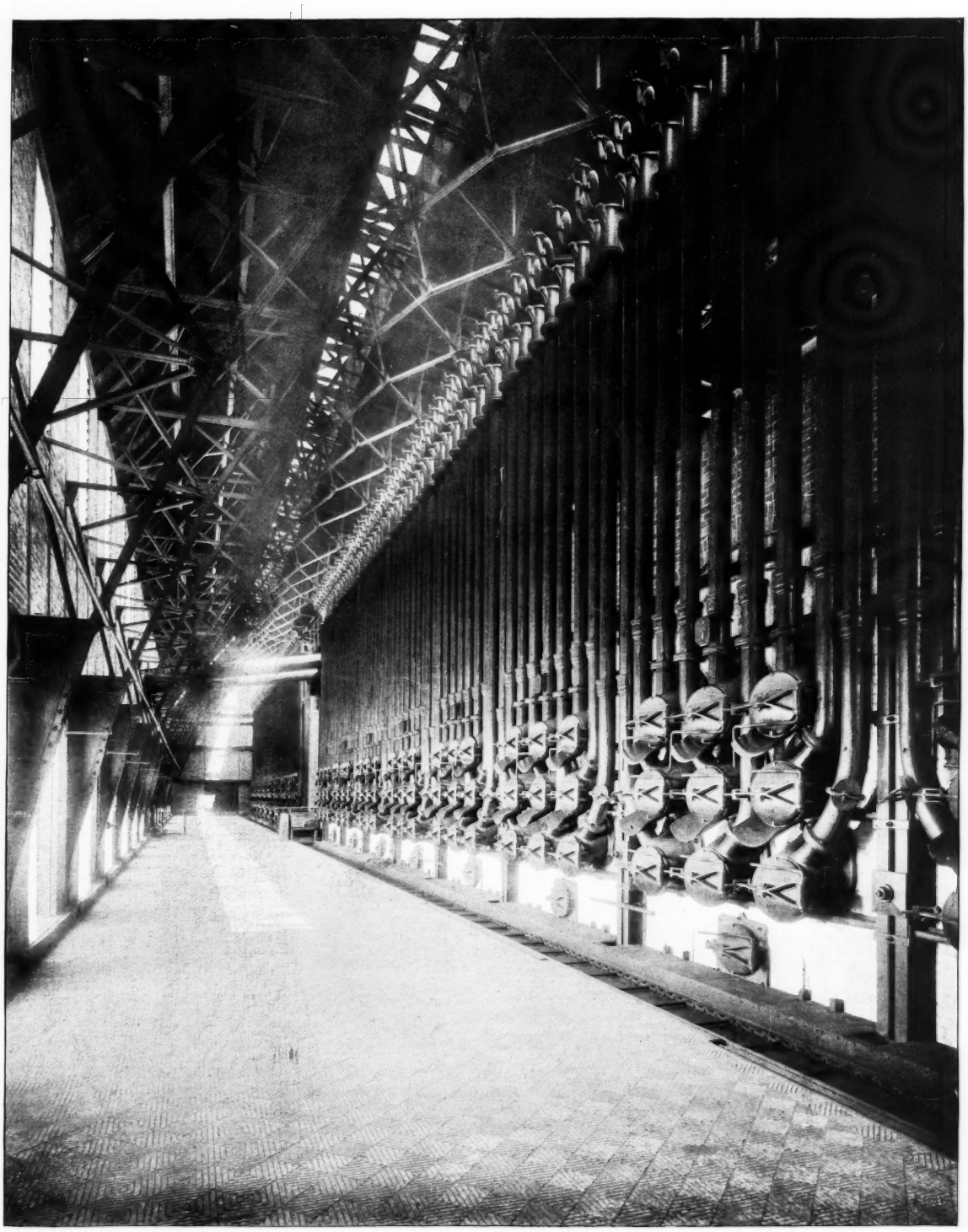


FIG. 8.—INTERIOR OF RETORT-HOUSE, WEST SIDE OF DISCHARGING FLOOR (MAY 21, 1902).

IMPERIAL CONTINENTAL GAS ASSOCIATION, MARIENDORF (BERLIN) WORKS.

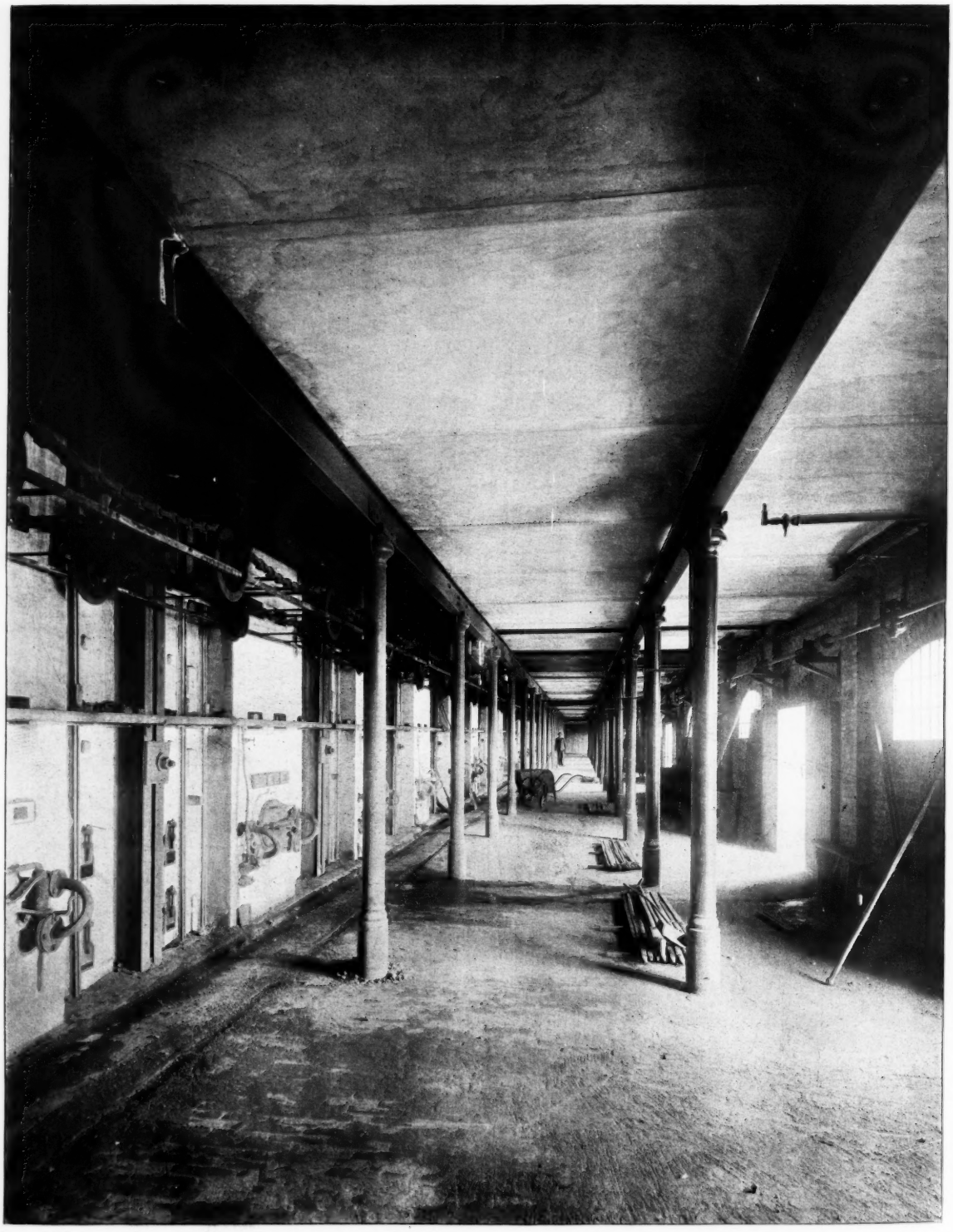


FIG. 9.—UNDERNEATH EAST SIDE OF CHARGING FLOOR, SHOWING GENERATORS (APRIL 22, 1902).

WATER GAS MANUFACTURE IN THEORY AND PRACTICE.

By Dr. James Kramers.

[Abstract Translation of a Communication published Last Year in "Het Gas."*]

(*Continued from p.* 1417.)

The Reduction of CO_2 by Incandescent Carbon.

This was the first question of Naumann and Pistor, and was answered by them. It is the same as the fifth point treated by Lang.

Naumann passed dried CO_2 at various temperatures over red hot charcoal, both quickly and slowly, and over both a great and a short length of charcoal. The temperature was determined by small closed tubes placed here and there, containing substances, of which the melting point was known, except that the higher temperatures were determined by interspersing directly pieces of metal, such as silver, gold, and copper, on which CO_2 does not act. It may be remarked that determining the temperature in this manner is faulty, for it only shows what the temperature must have been at one moment of the experiment, and not how long that temperature lasted. There was, however, no other means then of taking the temperature continuously. It would now be taken by a Le Chatelier's pyrometer, if the instrument could be properly placed in a porcelain tube, such as that with which the experiment was made.

Naumann's results show that the reaction begins at about 600° C., and increases with the temperature. The greatest proportion of CO, which was obtained at a temperature between 954° C. and 1054°C., and with a small layer of carbon, was 94·2 per cent. The gas in this experiment passed at the rate of 135 c.c. in eighteen minutes. It was intended to use this high temperature in another experiment in which the rate of passage of the gas was 150 c.c. in eight minutes; but this temperature could not then be obtained. Naumann's experiments show that the reduction of CO_2 takes place very well at ± 1000° C., and badly at ± 900° C. It would not be right, however, to conclude from this that the reaction at 1000° C. is imperfect, if the layer of carbon is long enough. Berthelot has attempted to show theoretically that the reaction $C + CO_2 = 2\ CO$ is always imperfect, and Rathke did not succeed in converting CO_2 and C perfectly into CO after heating for a long time at a high temperature in closed tubes. Lang also confirmed Berthelot's view by a series of experiments which may be referred to here. He passed CO_2 repeatedly over carbon at various temperatures. Generally equilibrium was soon established, which did not appreciably change when the action was continued for some time. Lang determined his temperatures in the same way as Naumann—that is to say, he ascertained that the temperature was reached, but not if, or for how long, it remained constant.

His researches also show that the most favourable result was at the highest temperature. The admixture of an indifferent substance N_2 does not appear to have any important influence on the proportion of CO_2 to CO. From these experiments, it may be concluded that probably a kind of equilibrium occurs; and therefore a fixed proportion of CO_2 corresponds to a fixed temperature. This will, however, only have been proved when it has been shown by experiment that CO_2 is produced when CO is passed over incandescent C.

It is now convenient to return to Lang's experiment, which was mentioned when dealing with his researches on the action of steam on carbon, but which, if H_2 be considered as indifferent towards CO, more properly belongs here. Inadvertently, Lang really, by this experiment, furnished a proof of the reversibility of the reaction $CO_2 + C = 2\ CO$. He caused a mixture, consisting of CO, H_2, and N_2, at ± 1000° C., to pass over incandescent carbon. From tests on the action of steam on red hot carbon, he had found that the percentage of CO increased with the time the mixture was kept over the incandescent carbon. Yet he thought there must be a limit, and that with the presence of a certain quantity of CO no more increase of CO would take place. He put a larger quantity of CO in the mixture than he thought could ever be reached, and expected that then no change would take place in the composition of the gas (he had thus not the least idea that the reaction could be reversed). He gave his result in all fairness, although it differed from his expectation. He thought he would be able to find an explanation of it. The mixture consisted of 32 per cent. of CO, 23·5 per cent. of H_2, and 44·5 per cent. of N_2; and after it had been passed twice to and fro through the tube containing incandescent carbon, the composition appeared to be 2·1 per cent. of CO_2, 29·1 per cent. of CO, 24·1 per cent. of H_2, and 44·7 per cent. of N_2.

Where did the carbonic acid come from? Lang had added an insufficient quantity of water vapour (he does not say how much, but the quantity must have been very small); and he explains the presence of the CO_2 by the reaction $CO + H_2O = CO_2 + H_2$, which he thinks would also account for the increase of the H_2.

* The author has used throughout chemical symbols in place of the names of elements and compounds; and though such use is open to serious objection, and is contrary to our usual practice, it has been retained *for the sake of brevity* in this translation.—Ed. J.G.L.

There are the following objections to this explanation: (1) If CO is converted with H_2O to CO_2 and H_2, then the volume would evidently increase (the volume of H_2O is never brought into account); and with the same quantity of N_2, the percentage of N_2 would thus decrease. According to experiment, however, the percentage of N_2 increases, or at least does not decrease. (2) The increase of the H_2 can be accurately reckoned, and an amount is found that is considerably higher than the analysis shows.

If it be accepted, however, that 2 CO has been converted according to $2\ CO \longrightarrow C + CO_2$, then the volume decreases; with the quantity of N_2 remaining the same, the percentage of N_2 increases, in agreement with the analysis. On this supposition, with the quantity of H_2 also remaining unchanged, the percentage of H_2 will likewise increase; and on calculating this increase, figures are obtained which perfectly agree with the analysis. For convenience of comparison, there are tabulated below the composition of the mixture: (I.) calculated on the supposition that the reaction $CO + H_2O = CO_2 + H_2$ occurs; (II.) calculated on the supposition that the reaction $2\ CO = CO_2 + C$ occurs; and (III.) according to Lang's analysis.

	I.	II.	III.
CO_2 per cent.	2·1	2·1	2·1
CO ,,	29·2	28·5	29·1
H_2 ,,	25·1	24·0	24·1
N_2 ,,	43·6	45·4	44·7

It will be seen that the figures for H_2 and N_2 favour II. rather than I.; while only the figure for CO is somewhat better in I. than in II. But if it be granted that the reaction $CO + H_2O = CO_2 + H_2$ is not excluded, then the analysis agrees perfectly, which, however, it does not unless the reaction $2\ CO = CO_2 + C$ is accepted at the outset.

When there was no CO_2 present, or at least not sufficient to establish an equilibrium, a certain quantity of CO_2 was formed according to the reaction $2\ CO = CO_2 + C$; and only when this quantity had become sufficient, was the reaction $2\ CO = CO_2 + C$ checked, and the upper hand obtained by the reaction $CO + H_2O = CO_2 + H_2$. This is shown by the composition found after the mixture had been passed eighteen times through the tube—viz., 3·1 per cent. of CO_2, 27·8 per cent. of CO, 25·8 per cent. of H_2, and 43·3 per cent. of N_2, which is in agreement with the above explanation.

It is thus practically shown that the reaction $CO_2 + C = 2\ CO$ is reversible, and that with a fixed temperature and excess of C (which is always present) an equilibrium becomes established. The results of Lang's experiments on the reduction of CO_2 by C are plotted in the annexed diagram, which also shows some results obtained by Harris, which will be next considered.

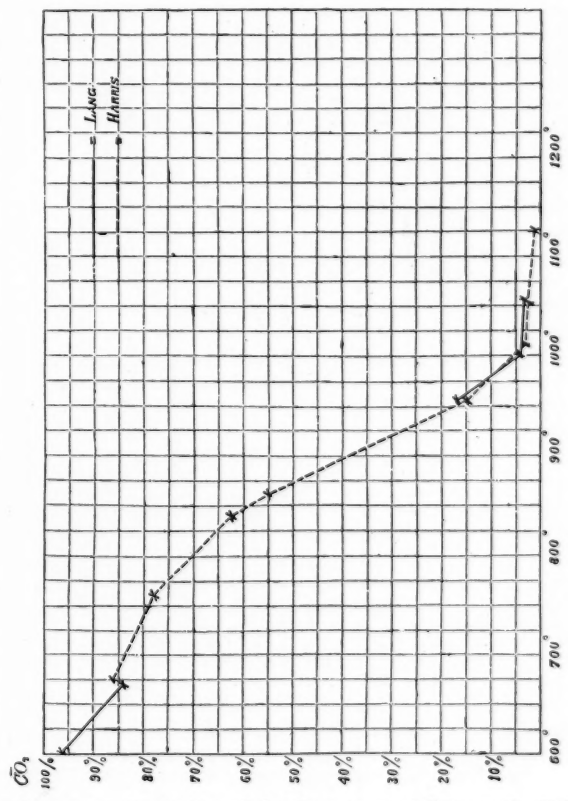


Diagram.—*Comparison of the Percentages of* CO_2 *on the Total Quantity of* $CO_2 + CO$ *found by* (1) *Harris from the Action of* H_2O *on* C, *and* (2) *Lang from the Action of* CO_2 *on* C.

Before leaving the reduction of CO_2 by incandescent carbon, the heat balance for this reaction may be given. According to

(2): $CO_2 + C = CO + O + C - 67{,}968$ cal.

and according to

(3): $CO + O + C - 67{,}968 = 2\,CO - 67{,}968 + 29{,}676$,

therefore

$$CO_2 + C = 2\,CO - 38{,}292 \text{ cal.} \quad (23)$$

This assumes that everything is at 0°C.

If CO_2 and C at 1000°C. be taken, and the CO formed be carried off at 500°C, then the C would bring 2400 calories and the CO_2 19,021 calories, or together 21,421 calories. The 2 CO formed would carry off 6860 cal. Therefore the CO_2 and C bring 14,561 cal. more than are carried off, so that under these conditions

$$CO_2 + C = 2\,CO - 38{,}292 + 14{,}561 = 2\,CO - 23{,}731 \text{ cal.} \quad (24)$$

It was found earlier (10) that the decomposition of H_2O under the same conditions took place according to

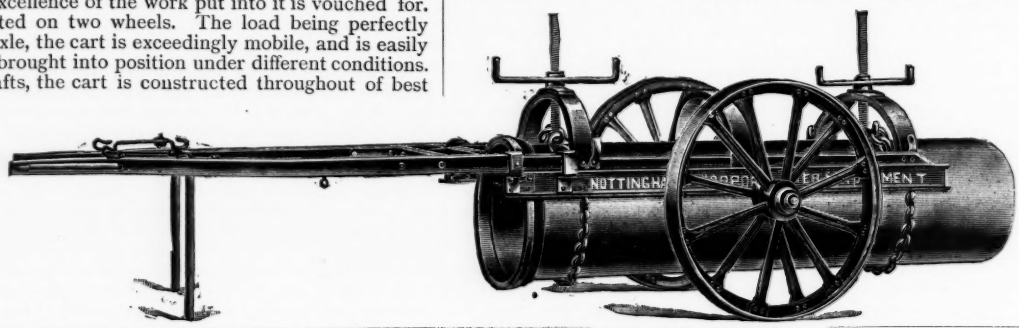
$$H_2O + C = H_2 + CO - 18{,}052 \text{ cal.},$$

so that the decomposition of CO_2 under these circumstances costs $\pm$ 5700 cal. more than the decomposition of H_2O. This agrees with what was found earlier—*i.e.*, that, on the conversion of $CO + H_2O \rightleftharpoons CO_2 + H_2$, about 5700 cal. are liberated.

(To be continued.)

THE TRANSPORT OF LARGE PIPES.

Long and large water pipe-lines and trunk gas-mains are continually on the increase; and a vehicle properly constructed and equipped for transporting the bulky pipes used, will be found more and more a necessity of large gas and water supply works. Thomson's patent pipe-cart is a new production for the purpose, and it is going to seriously challenge the supremacy for this work of the Janker cart. It is constructed by Messrs. Thomas Danks and Co., Limited, of Nottingham. As the illustration shows, it is remarkably compact; and, needless to say, being made by the firm named, the excellence of the work put into it is vouched for. The cart is mounted on two wheels. The load being perfectly balanced on the axle, the cart is exceedingly mobile, and is easily manipulated and brought into position under different conditions. Excepting the shafts, the cart is constructed throughout of best wrought iron and steel. The wheels are of the well-known type fitted to traction engines, and are specially designed to stand rough usage. The frames and the bridges which carry the lifting screws are of strong channel iron. This gives the maximum of strength, with the minimum of weight. The screws are of special steel, lathe-turned, and work in large gun-metal nuts. The carts are constructed in two sizes. The first is made to carry 15 in. to 30 in. pipes, ranging from 11 cwt. to 3 tons in weight; and the larger size, to carry 30 in. to 50 in. pipes, ranging from 30 cwt. to 8 tons in weight. One of the great advantages of this new cart is that only one man is required to load it. Its utility has been proved; and there should be a good field open for its adoption.



REGISTER OF PATENTS.

Prepayment Gas-Meters.—Cowan, W. H., of Westminster. No. 8557; April 25, 1901.

This invention relates to prepayment gas-meters having a circularly moving coin carrier or carriage—a modification of patent No. 28,828 of 1896, specially suited for use with an existing type of meter in which the coin is entered at a variable point and discharged at a fixed point.

In the earlier patent, the coin is inserted through a fixed slot, falls into a circularly moving coin carrier or carriage, and is discharged, after it has been moved through a certain angle, by means of a cam or cams; the point of discharge being varied (as the price of gas is changed) by varying the position of the cam. The present invention consists in a similar apparatus, in which the coin is inserted at a fixed slot, passes into a coin carrier or carriage, gears into a wheel whose rotation opens the gas-valve or releases a stop, and is discharged (when the requisite arc has been moved through) by means of a cam or blade spring. The novel points are the provision of a circular shield to retain the coin in its position until the point of discharge is reached; the shield being attached to an arm carrying the ejecting cam, and being provided with an inclined discharge edge, which co-operates with the cam in discharging the coin. Another part of the invention relates to an arrangement whereby the coin is inserted through a fixed slot in the casing, but does not gear with the internal wheel communicating with the gas-valve until it is moved through a variable arc.

Fig. 1 shows (in plan) a meter fitted with a coin-freed mechanism constructed according to the first part of the invention. Fig. 2 is an external side elevation of the prepayment device illustrated in plan, and a similar elevation, but with the iron front plate and prepayment disc

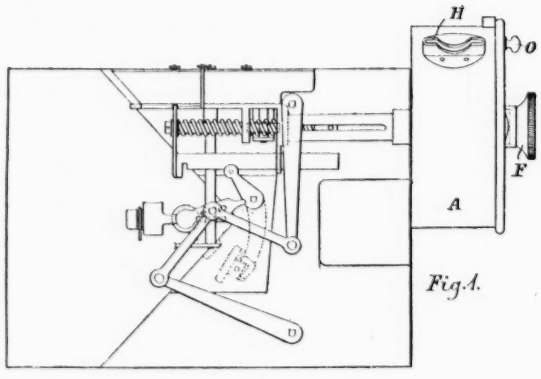


Fig. 1.

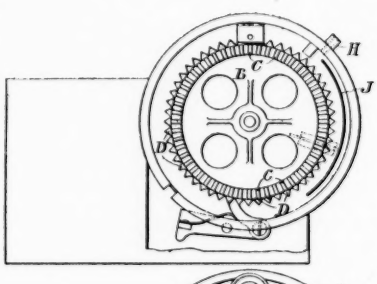


Fig. 2.

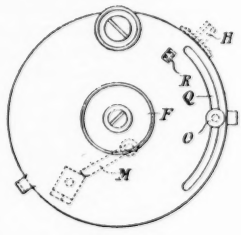
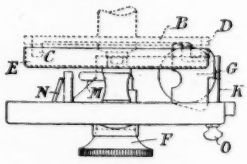


Fig. 3.



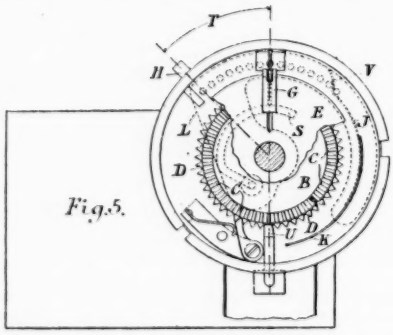


Fig. 5.

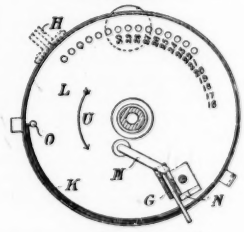


Fig. 4.

removed, exposing the measuring-out wheel. Fig. 3 shows the front plate of the prepayment mechanism, with the operating handle, coin-pocket, and prepayment wheel; the coin-pocket and coin having been turned into the horizontal position. Fig. 4 shows, in elevation, the inside face of the front plate and price-varying disc, with the coin in position at the stop or point of discharge. Fig. 5 shows (in elevation) prepayment mechanism constructed in accordance with the second portion of the invention. In this view, the front plate is removed, and the carrier disc partially removed.

As applied in a meter of the screw or "quiescent" type (fig. 1), the patentee provides a meter attachment comprising a circular case A, in which is enclosed a prepayment wheel B, carrying teeth C on its front face and ratchet teeth D on its edge. The wheel drives the screw by means of the long split-sleeve shown. A circularly moving disc E oscillates within the casing, and is moved by a wheel or handle F from the outside. The coin-pocket G, carried on the disc E, is brought into coincidence with the slot H in the meter-case, through which the coin is inserted; and the disc E is moved, carrying with it (by means of the coin) the crown-wheel B. As the coin is moved by the pocket and disc E, it passes under a shield, curved circumferentially, which continuously supports the coin until the point of discharge is reached. The shield is preferably formed in two portions—one (J) fixed to the back of the casing, and the other (K) to the price-varying disc L. At the point of discharge, the part of the shield secured on the price-varying disc is cut away at an angle, as shown. The price-varying disc carries a cam M, which takes the form of a rod of thick wire set at an angle. This cam lies in the path of the coin-pocket, which is grooved to receive the cam. When the disc carrying the coin-pocket is turned round to the exit position, it comes in contact with the cam M, which forces the coin outwards against the edge of the shield, and the disc is brought to rest by the coin itself coming into contact with the stop N. This ensures the coin always stopping at the same point for any particular setting of the price-varying disc. A second stop may be provided in the path of the coin-pocket, so as to prevent the pocket being turned farther on in the same direction after the coin has fallen out. The cam M and stop N, being both secured to the price-varying disc L, are set in position by means of a pin O passing through a segmental slot Q. The pin may carry a pointer moving over a scale on the edge of the slot, or, as illustrated, the disc itself may be engraved, and may show through a slot R in the front of the apparatus. The point of delivery will be seen to be to the right of the vertical line; the direction of rotation of the coin-pocket being marked by the circular arrow-headed line U. By this device, the advantage of a fixed slot is obtained for the insertion of the coin; while it is ensured that the coin is discharged when the desired circular movement is completed, notwithstanding the variation of the position in the circle where discharge is required through a considerable range.

As illustrated in fig. 5, the coin passes through a fixed coin-slot H into a carrier or coin-pocket Q as before, carried on a circularly moving disc E, with a flange on it to prevent the coin being inserted in the mechanism through the slot H, except when the coin-pocket is in position. The coin is prevented from engaging in the teeth C of the crown-wheel B by means of a covering plate lying in front of certain of the teeth of the wheel, or as shown by means of a curved rod or guide S which supports the coin in a position upwardly out of gear with the teeth. This fixed coin-slot H lies over to the left in the elevation shown. This is on account of the exit point for the coin being also fixed and situated in the best position for delivery of the coin under gravity alone into the coin receptacle. The price-varying plate L is set, as before, by means of a screw. The end of the shield K in this modification is quite straight, and not inclined as in the previous case. In operation, the coin is delivered through the fixed coin-slot H into the coin-pocket G on the disc E, which is then turned by means of the handle F. The coin rests in the pocket on the cam until the pocket has passed over the end of S, when it falls down into gear between the teeth C of the crown-wheel B, or is forced down by a cam or spring. The further motion of the handle then turns the prepayment wheel B, setting the meter to deliver a given quantity of gas; and when the coin-pocket strikes the stop U, the coin falls out into the receptacle, and the coin-pocket can then be turned back to the initial position—the meter having been set for the delivery of a given quantity of gas in exchange for the coin.

Burning and Seasoning Incandescent Mantles.—Mackean, W., and Walker, E., of York Street, Westminster. No. 13,480; July 2, 1901.

This apparatus, for burning and seasoning incandescent mantles, comprises a row of burners, a number of gas-jets vertically above each burner, a vertically sliding bar to support a row of mantles one between the upper gas-jets and each burner, and cams to give the sliding-bar reciprocating movement and to control a gas-cock on the pipe supplying gas to the apparatus. The burner employed comprises an inner tube and an outer tube of slightly larger diameter than the inner tube, fluted on its exterior surface and perforated near the top.

Manufacture of Gas and Coke.—Johnson, J. Y.; a communication from the Duetsche Continental Gas-Gesellschaft, and Julius Bueb, of Dessau, Germany. No. 16,211; Aug. 12, 1901.

The object of this invention is to effect improvements in the process of manufacturing gas and coke described in patent No. 13,814 of 1900, by which "it is possible to approach still nearer the known process of the coking ovens, without affecting injuriously the quality of the gas produced." The powdered form of the coal required by the process, the patentees remark, necessitates it being shovelled into the retorts; and this is a troublesome operation occupying much time. It has, however, been found that this powdered form of the coal has the advantage that, after moistening, it can be formed into cakes by pressure, which permits of doing away with the shovelling into the retorts. But the usual oval or Ω shape of the retort is disadvantageous; and therefore it is proposed to employ retorts which are rectangular in cross section, into which the cakes of pressed coal dust can be introduced in the same manner as loaves are introduced into a baker's oven.

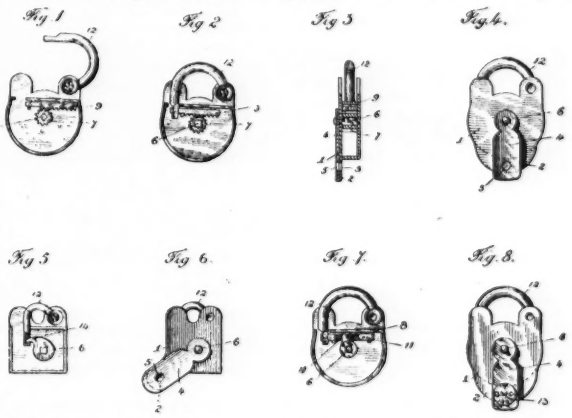
The height of the retorts it is proposed to make equal to, or preferably greater than, the width; and the cakes of coal dust formed by pressure are approximately of square section, so that the gas evolved has not to pass through any thick layer of coal, and there is left in the retort a sufficiently large space for the evolution of gas. This arrangement is said to have the further advantage that the charging and discharging of the retort can be combined. To effect this, the retort is provided at both ends with doors,* both of which are opened when the cakes are introduced; the fresh cakes so introduced pushing the coke formed out through the rear opening.

The earlier process "is greatly simplified by the present invention, and presents the advantage over the retorts of the usual cross section employed for making gas, that retorts of rectangular cross section have a greater capacity than the former, without the manufacture of the gas being injuriously affected thereby. The fact that the charging in of the coal to be converted into gas and the discharging of the coke formed in the retorts are no longer affected by shovelling, presents the further advantage that the retorts may be made much longer than hitherto; and they may consist of separate members assembled together in rows after the manner of sectional steam-boilers, so as to combine, according to the amount of space available, a number of individual members in a single installation."

Padlock.—Pooley, H., of Stafford. No. 22,134; Nov. 2, 1901.

This is a padlock (mainly for use with prepayment meters), the hasp of which can be locked and unlocked without the aid of an ordinary key, and the mechanism, when locked, can be sealed by a lead or other seal, which must be destroyed to unlock the padlock, so that, should the padlock be surreptitiously opened, such opening will be indicated.

Fig. 1 is an interior view of a padlock in an unlocked condition, and in which a pinion is revolved to actuate the locking-bolt by engaging teeth formed thereon; the front plate being removed. Fig. 2 is a similar view, with the bolt shot home and the hasp locked. Fig. 3 is a section of a complete padlock. Fig. 4 is a face view of a complete



padlock, the lead seal not affixed. Fig. 5 is an interior view of a square-shaped padlock (the front plate being removed), in which the hasp is locked by a claw fixed on the actuating spindle. Fig. 6 is a face view of a complete padlock, the projecting portion of the front plate being from the corner instead of from the bottom as at figs. 3 and 4. In this view, the padlock is shown in a locked position; the lead seal not being applied. Fig. 7 is an interior view of a padlock in which the bolt is provided with a slot for operation by a projection on the actuating spindle. Fig. 8 is a face view of a complete padlock, with the lead seal applied.

The lower front or edge of the padlock 1, is formed as a depending piece or projection 2, having in it a hole 3. To the padlock is pivoted a plate or lever 4, this also having a hole 5, which can be made coincident with the hole 3. On the pivot 6 of the plate or lever is secured a toothed pinion 7 as at figs. 1, 2, and 3, a quadrant or projection 8 as at fig. 7, or the like, which engages teeth 9 (or slot 10) on the locking-bolt 11; so that when the lever 4 is moved in one direction it will pull the bolt back, and when moved in the other direction it will push the bolt home, for engaging and locking the hasp 12—the hole 5 of the plate 4 and the hole 3 of the depending piece or projection 2 being at this position coincident with each other. So that a lead or other seal or fastener 13 can be passed through the two holes 3 and 5 and secured thereto, and impressed with the seal or mark of an official or company as at fig. 8—the sealing being such that to unlock the padlock it is necessary to break the seal.

Instead of a toothed pinion or quadrant and a bolt, the fastening-device may be formed of a hook 14 fixed to the pivot 6 as at fig. 5. Other means or devices may, however, be employed; the feature of the invention being "the locking of the padlock by the movement of a lever and without the use of a key, and the sealing of the lever with the padlock."

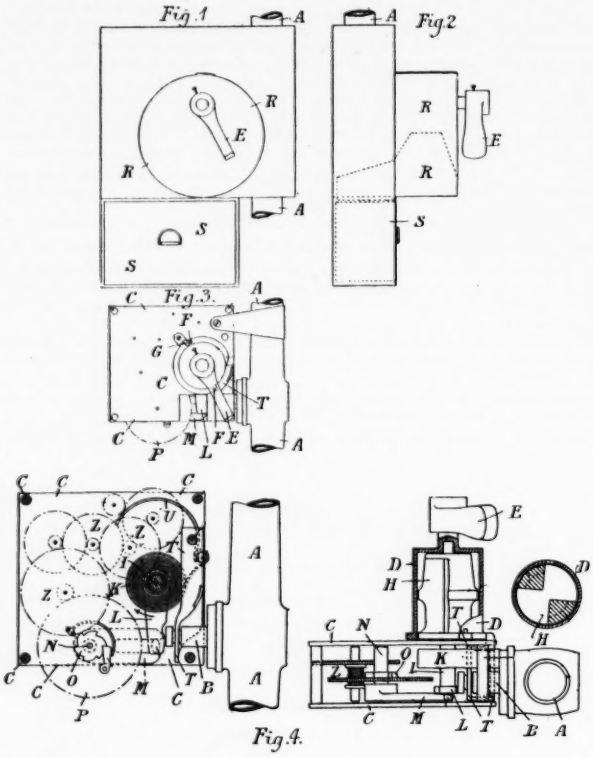
Prepayment Gas-Supply Controlling Apparatus.—Cooney, H., of Tooley Street, S.E. No. 5851; March 10, 1902.

This meter is adapted to supply gas over a predetermined period, and either in one continuous supply or piecemeal, at intervals; and it "can be used with advantage in the bed rooms of hotels, lodging houses, and the like."

Fig. 1 (p. 1498) is a front elevation, and fig. 2 an end view, showing the apparatus on the outside. Fig. 3 is a front elevation showing the mechanism with the casing removed. Fig. 4 is a side elevation of the apparatus, with the front frame-plate of the mechanism removed, and showing the mechanism behind it; also a plan viewed from below, and partly in section, and a cross section through the coin-receiving and operating mechanism.

* There are no illustrations given with the specification.

A is an ordinary gas-tap or valve-case, of which B is the spindle of the valve proper; the valve being closed, and the supply cut off, and opened, and the supply turned on, by pressing the spindle in and pulling it out respectively. C are the two frame-plates coupled together by pins or studs, in which the moving parts are supported. D is an operating and receiving box, into which the coins are inserted—mounted on the side of the case C. E is the actuating handle mounted on a spindle on the end of same; while there is a slot in the upper side



of the case in which the coins are inserted. This case is adapted to be rotated for about half-a-circle, and its movement is limited, having two pins F on the flange which operate in connection with the stop G, fixed on the frame.

Within the actuating-box D, there is a revolvable pocket device H, fixed on a shaft I, carried in the frame C; and in the centre, this device has a peripheral bar, by which coins are prevented from being introduced until the gas paid for by the introduction of a coin has been consumed. On the shaft there is fixed the inner end of a coiled spring K, the outer end of which is fixed to a bar on a moveable lever hereafter described. There is also on the shaft I an arm L, on the end of which is a projection working in connection with the slot in the arm M, fixed on the spindle N. On this shaft, there is also fixed a ratchet wheel O; while a toothed wheel P is loosely mounted on the spindle, and has fixed upon it a pawl adapted to engage with the teeth of the ratchet wheel O. Gearing with, and driven by, the wheel P, is a train of wheels Z, which drive a "fly" acting as a speed governor.

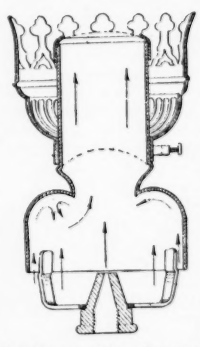
When a coin is introduced through the slot in the case D, the coin couples the case with the device H inside it; and when the handle E is turned, the device is also turned, and the shaft I is revolved with it. This action does two things. It winds up the spring K, so storing a certain amount of energy, and at the same time revolves the arm L away from the valve-spindle B. This moves with it the arm M on the shaft N, in which action the ratchet wheel O will simply pass under the pawl, moving it out of the way, and without revolving the wheel P and the wheel-train Z connected with it. The limit of movement of these parts is about a quarter-of a-revolution. When this is reached, the mechanism is stopped; and upon the handle being released, the coin will fall out of the devices D, H, into the case R, and thence to the drawer S.

While the coin is in the parts D and H, and they are being revolved by the handle E, the gas-valve is not opened, as the flange of the box D will have come in contact with a projecting part of a hinged lever T, connected at its outer end with the outer end of the gas-valve spindle B, and will thereby have moved the lever towards the tap and pressed the spindle in and closed the valve. Then, to supply gas, the valve, spindle B must be pulled out. This is done by revolving the handle E in the reverse direction to that in which it is moved in the setting action. Upon this handle being so turned, the flange of the box D (which is cut away) moves off and leaves the portion of the lever T; and the end of the spring K, which is connected to the lever T, pulls it and the spindle B out, opens the valve, and allows gas to flow. Conversely, to shut the valve and stop the supply, the lever E is turned so as to push the lever T away outwards, and close the valve. At the same time, by the movement of the lever T, a spring brake, or stop-finger U, fixed on the lever as shown, is moved towards the periphery of one of a series of train wheels, and the point of the finger coming in contact with the periphery of the wheel, engages it, and stops the train of wheels and the action of the apparatus. When, however, the lever T is moved inwards, and pulls out the valve-spindle B, the finger is moved backwards so as to free the train, which is again started and operated by the spring K.

The action of the spring, and its mode of driving the mechanism, is that, when freed, it revolves the shaft I in the opposite direction to the arrow, and so moves the arm L towards the valve-spindle B. In this action, it moves the arm M outwards; and by this arm, and by reason of the ratchet wheel O being fixed on the shaft N, the wheel P, through the pawl on it, is revolved, and hence the train of wheels Z and the "fly" will be revolved. When the time for which the supply of gas paid for has expired, the outer part of the arm L will have reached the valve-spindle B; and in the latter portion of its stroke it will press the spindle in, and close the valve, so as to shut off any further supply.

Upon inserting a coin the parts D H, and actuating the handle E, the apparatus can be set to supply gas for a given period; and then afterwards, by the turning of the handle backwards or forwards, the lever I connected with the valve-spindle is moved outwards and inwards, and so gas is turned on or cut off, as desired. And while any part of the gas paid for remains unconsumed, the peripheral bar or rib of the device H will be under the coin-slot (no matter where the case D is moved to), and hence no coin can be introduced; and not until the arm L has come in contact with the valve-spindle B, and closes the valve, does the rib pass to a point where, when the box D is turned to the position for receiving a coin—*i.e.*, with its slot under the slot in the case R—can another coin be inserted in the apparatus.

Burners for Lamps Employing Incandescing Mantles.—Stoltenhoff, H., of Cologne. No. 15,476; July 30, 1901.

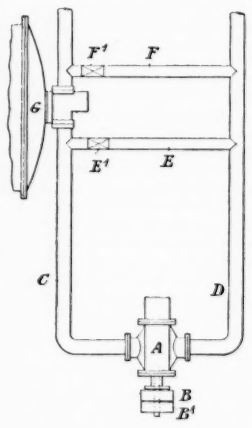


This invention consists in an arrangement of a mixing-chamber for air and gas; the object being to render the mixture more intimate than that obtained from the usual form of bunsen burner.

As shown, the chamber is formed of considerable diameter, open at the bottom; and below it is centrally arranged a nozzle forming the gas-inlet—the size of the chamber enabling a far larger quantity of air to be drawn in than is usual. Above the chamber is a cylindrical tube connected to it by a contracted portion projecting more or less into the chamber in such a manner as to form a curved neck, "which causes the air in the chamber to be whirled around and baffled or beaten back, so that very complete admixture with the gas is effected before it enters the cylindrical portion above," which it does preferably through a metal gauze diaphragm, finally reaching the combustion point and the mantle through a perforated metal or gauze cap or disc on the end of the tube.

Obtaining High-Pressure Gas.—Sale, M. T., and Onslow, A. W., of the Royal Arsenal, Woolwich. No. 7608; March 29, 1902.

In order to obtain high-pressure illuminating gas (chiefly designed for use in incandescent lighting), the patentees propose to make use of a mechanical blower—preferably of the kind known as the Piftin blower—in the service-pipe; and in conjunction with the blower, to have a safety or release valve designed to allow the surplus gas to pass back into the main from which the blower draws it, should the pressure become too great. Furthermore, there is a bye-pass between the supply and discharge pipes, provided with a valve, whereby, when the blower is not at work, gas at the ordinary pressure can pass to the burners. A is the blower; and B, B^1 are fast and loose pulleys respectively upon the blower shaft, connecting with any suitable source of power. C is the supply-pipe to the blower, and D the discharge-pipe therefrom—forming the high-pressure main which feeds the incandescent burners. E is a connection between the mains C and D, provided with a valve at E^1, which acts as a safety valve so as to allow any surplus gas which may be forced into the main D to pass back into the main C. F is the bye-pass between the two mains, and F^1 is the valve which is fitted in it; the bye-pass and valve having for their object to automatically allow gas at the ordinary pressure to pass to the main C and thence to the burners when the blower is not in work. G is an anti-fluctuator provided in connection with the supply-main C for preventing the action of the blower from setting up injurious fluctuations of pressure of the gas in the low-pressure main.



APPLICATIONS FOR LETTERS PATENT.

11,454.—Carew-Gibson, C., "Register dials for gas and water meters." May 20.

11,490.—Faben, C. R., jun., "Gas-purifier grid." May 20.

11,525.—Feldmann, A., "Saturator for the manufacture of sulphate of ammonia." May 20.

11,535.—Choulet, J., "Application of acetylene as a disinfectant and insecticide." May 20.

11,614.—Boult, A. J., "Gas-meters." A communication from La Compagnie pour la Fabrication des Compteurs et Matériel d' Usines à Gaz. May 21.

11,644.—Keith, J. & G., "Lighting incandescent burners." May 22.

11,663.—Cuttell, T. L., and the Anti-Vibration Incandescent Lighting Company, Ltd., "Incandescent gas-lamps." May 22.

11,751.—Sparks, H. & E., "RaisIng and lowering a gas-flame at predetermined times." May 23.

11,768.—Stanger, D., "Gas and like engines." May 23.

11,784.—Werthen, M., "Incandescent gas-burners." May 23.

11,901.—Harknett, A. G., "Gas-carburetting spray." May 24.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

Flame Luminosity and "Cheap Gas."

SIR,—Mr. Jones chooses to designate his recent paper, in public support of low-grade gas, as a "false issue," in a current discussion of that question. Does he, then, use one set of figures in advocating that heresy, and another in attempting to escape destructive criticism? Otherwise, he is confuted out of his own mouth, as well as repeatedly by me.

As for his paper, he is wise in consigning it to oblivion—and this wisdom is of new grace. I scarcely anticipated such prompt apostasy when I reviewed his figures. Better than never, however, is his belated perception that his own figures, when analyzed, destroy the arguments they pretend to sustain; and he fulfils my present mission as completely by repudiating his own paper, as by the franker course of admitting my arguments.

But these are droll times. First, editorial defence of a momentous issue spends itself in quibbling over the word "dilute;" and, next, Mr. Jones (eschewing such defence before the editorial ink is dry) avows himself, in a public paper, the apostle of "dilution"—both qualitative and quantitative, and then promptly repudiates the very paper of which he has just delivered himself.

I have three times stated my case *in extenso* (*ante*, p. 824, p. 897, p. 1194), and finally, to prevent further "false issues," I numerically summarized my points and conclusions (*ante*, pp. 1194-5). Personal aspersions break no bones and disprove no points; so until Mr. Jones (or another) reads and digests my statements, and advances some relevant counter-argument, I see no use in continuing this correspondence. I have protracted it to this extent only lest someone, unfamiliar with this question, be tempted to practice Mr. Jones's "theories."

A. G. GLASGOW.

38, *Victoria Street, S.W., May* 30, 1902.

The Incidence of Duties on Commodities.

SIR,—The writer of the "Editorial Note" on the above subject this week finds it difficult to follow the reasoning of one who objects to the export duty on coal because the duty may fall upon the exporting country, and to the import duty on corn because the duty may fall upon the importing country. He "chortles" over what he fancies is the fact that the imposition of the coal export duty and of the corn import duty within a year of each other puts the political economists on the horns of a dilemma. But no such dilemma exists. The writer of the note appears to think that, as nations must levy taxes and duties, it matters little or nothing what they levy those taxes and duties upon, nor who has eventually to pay them. That is finance about as scientific as would be that of a gas conpany saying that it is obliged to get its revenue from somewhere, so it might as well charge its consumers according to the rent of their houses, instead of according to the amount of gas used. Would the consumer "shrug his shoulders and pay"?

I am not going to enter here into a long examination of what John Stuart Mill called the "complicated" question of the incidence of export duties, but merely wish to show that there is nothing necessarily mutually destructive in the opposition of a free trader to an import duty on corn and to an export duty on coal because of their incidence. It is quite possible for import and export duties alike to fall upon consumers in the country imposing them. For an export duty on a commodity to fall upon the consumers in the importing country, it is necessary for the exporting country to be the only one supplying the importer with that commodity. Otherwise, the competition of other nations which have not put export duties on the commodity will oblige that which has to pay the duty. Import duties, on the other hand, being levied on all imported supplies of the dutiable article, fall directly upon the importing country. English pig iron has to compete in foreign markets with American, German, and Belgian. If, then, we put 5s. a ton duty on exported pig iron, will the consumer pay it? We import iron ore from Sweden and Spain. If we put an import duty on iron ore, will not the consumer pay it? But if Sweden, and not Spain, puts an export duty on the ore, will not Sweden have to pay it, or lose orders?

Apart from the question of incidence, of course, free traders object to any duties levied for the purpose of influencing the course of trade, instead of for revenue purposes only, and also to duties which have the effect of influencing the course of some particular trade to the benefit or detriment of others, whether levied for that purpose or not, believing that such duties militate against the prosperity of the country as a whole to an extent altogether disproportionate to the revenue derived from them. The essential viciousness of Protection—import duties on commodities which are produced in the importing country—is that the National Exchequer does not benefit to an extent equal to the burden put upon the consumer; so that, in effect, the consumers of the commodity are taxed partly for the benefit of the Exchequer and partly for the benefit of the home producer.

As to the corn tax, its supporters are telling us (1) that it will be paid by the exporter (the "d——d foreigner"); (2) that no one will feel it—the money will fall like "the gentle rain from heaven;" (3) that the British workman will pay it gladly, as part of his contribution to the cost of the war. That is an excellent specimen of the clear-mindedness of the unscientific "economist."

Apparently we are in for a re-opening of the question of whether Free Trade is or is not vital to the prosperity of this country. The eventual result will be that many who declaim political economy and deride scientific finance will discover to their surprise that shrewd commercial men like Cobden, the cotton manufacturer, and philosophical thinkers like John Stuart Mill and Adam Smith—professed political economists though they were—really understood the business of this nation better than those who think that if the country needs money it is a matter of no consequence how it is provided.

FREE TRADER.

May 31, 1902.

[It is a little difficult to perceive what our correspondent is driving at in the opening paragraph of his letter, if it is not the abolition of all import and export revenue duties whatsoever. This is all very well, but has the drawback of leaving the objector with the responsibility of proposing some source of national revenue which shall be free from all such objection. Even our correspondent, however, shrinks from laying down the law as to who really pays such duties. He tries to raise the spectre of Protection, but ignores the essential difference of amount that must distinguish a duty imposed for the purpose of influencing trade from one that is put on for revenue purposes only. We venture to point out that the latter is the nature of both the coal and corn duties, and suggest that this is borne out by their amount, which is far below the ordinary variations of the markets from year to year. Surely, a Protective duty is one designed, and proportioned, to overpower all mere market fluctuations? It is rather absurd to pretend that the circumstance of the Chancellor of the Exchequer being compelled to widen the basis of national taxation is to be interpreted as challenging the validity of Free Trade for this country. Rather it may be understood to reopen the question as to whether the very philosophic and scientific Chancellor who took off the registration duty on imported corn (which Mr. Gladstone left alone), and wished to put a duty of ½d per box upon matches, was the ultimate repository of all that was good in the traditions received from Adam Smith and Cobden. We shall be glad to hear from "Free Trader" again; but he must remember the Match Tax.—ED. J.G L.]

Manchester and Sheffield Comparisons.

SIR,—In your issue of May 13, you say that no two places are situated precisely alike, and that therefore an exact comparison is out of the question so far as management is concerned. In this, I agree with you. It is, however, the advice you give to Sheffield gas consumers—to "Let well alone"—that leads one to wonder what might have been the case had the Corporation of Sheffield been alive to its responsibilities in the past.

Suffice it to say that if the Sheffield Gas-Works had belonged to the ratepayers, and were paying proportionately no more in capital charges than Manchester, they would be saving about £44,000 a year—equalling a rate of 8d. in the pound on the rateable value of their city—truly a formidable sum to pay for the privilege of being supplied by a Gas Company, and a heavy penalty for remissness of a past generation.

QUI VIVE.

Manchester, May 29, 1902.

The Welsbach Licences.

SIR,—I have followed with no little interest the correspondence, and your comments thereon, in connection with the licence settlement of the Welsbach Company; and it certainly appears to me that if Mr. Livesey is not in a position to deny the assertions contained in Mr. Radclyffe's last letter, then a grave injustice has been committed.

It is perfectly obvious that Mr. Livesey could not have contemplated a licence scheme when he appealed to the gas companies for contributions wherewith to finally test the validity of the 1893 patent; but it is a fact, which I am in a position to vouch for, that Mr. Radclyffe had been endeavouring to bring about the scheme now accepted by both sides some considerable time before Mr. Livesey made his appeal.

If certain sections of the trade considered that Mr. Radclyffe had earned some recognition of a substantial character—as they evidently did when signing the commission note—I cannot see that such recognition concerns anybody but the parties interested. But when Mr. Livesey takes to himself the whole credit of arranging the licences, naturally those who have promised to pay conclude that they are paying Mr. Radclyffe for results achieved by somebody else.

Referring to Mr. Radclyffe's application on the fund subscribed by the gas companies, surely there is nothing very criminal in this! Mr. Livesey contemplated an expenditure of £10,000; but a settlement was effected for £3000, and it is clear that the saving of £7000 was not due to Mr. Livesey. Why, then, this controversy? Personally, I have no interest either way, but like to see fairplay.

A. F. TAPP, Secretary
Incandescent Trust, Limited.

Union Court, E.C., May 28, 1902.

SIR,—I have to thank you for inserting my letter dated May 22. I notice that Mr. Livesey does not contradict mine of May 16; so the question of my services remains undisputed. I hoped that, as others have benefited so largely, they would have taken up the cudgels for me. I am, however, still left to answer all the "digs" I am getting from you and them.

You have chosen to publish a commission note. This must have been given to you by one who has profited by my intervention; and, as this has been done, it is as well to let your readers know all. At a meeting of the trade (held at their Solicitor's office), there was a unanimous expression of opinion that the action I took in bringing them all into line was a wise one. This is largely endorsed by you and Mr. Livesey and others, and by the fact that all are invited to take up licences, and by the settlement effected by the Guaranty and Voelker Companies. The trade present, therefore, agreed that remuneration was due to me; and as the benefits to be derived were considered so large, a sum of £100 was not regarded as too large an individual contribution. That is the agreement entered into which you publish. It was considered also that the other participating companies should do likewise. It was not possible then to approach the others, as the question how the settlement with Mr. Livesey—who might oppose the settlement, even though the Voelker and United Chemical Companies agreed—would work remained an unknown quantity. It would have been premature to approach any of the other litigants till the *raison d'être* had become a *fait accompli*.

But the expression of opinion was endorsed by the fact that members

of the trade present agreed and authorized the Solicitor to proceed to accomplish the happy termination of hostilities. As the other litigants would benefit so largely, they hoped that they too would fall into line, and do as they wished to do. I had at that time no fear of a contrary conclusion; as I had been complimented by Mr. Livesey, the other litigants, and their Solicitors, that the trade generally "owed me a debt of gratitude." All their flattering talk was an incentive to perseverance, but how does it turn out now? One and all will accept the fruits, but not pay for the cultivation; all would now follow Mr. Livesey's and your advice, and shunt the man who has made it all possible.

Commenting on the wholesale granting of licences, I think a mistake is being made; and there is much to be said in favour of those who have borne the expense of litigation. It strikes me as unfair that all who apply should have licences. I doubt if the Welsbach Board, which is composed of shrewd business men (as is proved by the policy of compromise), have committed themselves to such a blunder. It is true the best mantle will win; but it may be held by some licensee who paid nothing for the privilege, as the litigants have done. Even Mr. Livesey admits an outlay of £3000. Why should all obtain for the asking, and why are terms so prominently published? One fact stands quite clear. All are anxious for the licence; and Mr. Livesey is profuse in expatiating on its advantages. I maintain that this was brought about by me; and I challenge Mr. Livesey or any one else to refute it.

Long before Mr. Livesey started his "break-up" scheme, or the present Board were in existence (there are members of the Investigation Committee and Board who can corroborate this), I proposed such a scheme, and was repulsed. Then the Committee of Investigation was appointed. I found names I knew. I again made proposals, which were dubbed "visionary" and "impossible." But from the encouragement I got I persevered. The difficulty was who should first make the advance; and here I was stopped till I sent out this circular: "Would you be disposed to accept the suggestions of an intermediary who has a perfectly free hand and unbiassed, who has no monetary or other interest beyond that of rendering a service to both sides, and preserve a splendid industry? [Then follow my proposals.] Your reply to this if favourable will enable me to bring all parties into line, and an early agreement can be arranged." Then, one by one, I obtained verbal consents, till at last I had the pleasure of accompanying the trade's Solicitor to the Welsbach Board. The result is common knowledge.

Does Mr. Livesey, whose first assault was to destroy the Welsbach rights, assert that he was instrumental in proposing this happy termination? If so, it is a remarkable coincidence that not only does he adopt the proposals I made, but he places them in the order I gave, and even adopted the language I used. There can be no doubt that the advantages to all concerned is enormous; and it is a piece of ingratitude to cast a slur of suspicion, as is conveyed in Mr. Livesey's letter of May 8. This has had disastrous consequences to me. This is evidenced by the hostility you display, as you advise the trade "No agent required." Now would you or anyone else have said this nine or three months ago? Would you not have looked upon the man who proposed to settle 800 or 900 writs by compromise as a "visionary," as others did? Now it is made possible, the intermediary's services are dispensed with. It speaks for itself. Ingratitude is a mild term for the action of those who profited by my services, and would now escape their obligation.

It is a pity the "mantle trader" who can do so much now did not help himself before; and, to use your own words, "it is right" the facts as to how it has been made possible "should be as widely known as possible." It seems to me a pity that you, who are so profuse in your desire that all should profit by the settlement, did not hit on the mode of procedure, and have done your subscribers a greater service than you evidently wish to do me. There is much in your advice *now* that is good—late though it is. As I have given Mr. Livesey a chance of withdrawing, I shall feel called upon to prove my position, and verify his forecast.

D. EDWARDS-RADCLYFFE.

May 28, 1902.

[Each successive letter received from Mr. D. Edwards-Radclyffe in large part merely states in different form what he has said before; but words do not constitute proof that he deserves consideration at the hands of the gas industry, nor are we yet convinced that he has an enforceable right to any from the incandescent trade. In his present letter, Mr. Radclyffe speaks of a circular which he states he sent out, offering his services as an "intermediary" between the trade and the Welsbach Company; and in the circular he declares his qualifications to be that he has a "perfectly free hand," is "unbiassed," and has "*no monetary or other interest beyond that of rendering a service to both sides*, and preserve a splendid industry." Now the italicized words are altogether incompatible with Mr. Radclyffe's present position. He himself to-day tells us—if not in exact words, by his claims—that he had privately some other interest in view, and that was the hope of a money reward, if successful in his intermediation. He took up the work, according to his circular, absolutely disinterestedly; and to-day the supposed graciousness of his act fades away as he stands before us a suppliant not only for a substantial money reward from the guarantee fund of the gas industry, but for payment from the incandescent trade. It is clear from this that Mr. Radclyffe has a very high opinion of the value of whatever services he may have rendered—much higher apparently than people rate them at. It is really surprising that he should stop at claims against the gas industry (who never received him as an intermediary) and the incandescent trade; and we will offer him, without any "interest beyond that of rendering" him "a service," the suggestion that he should now prefer a claim against the Welsbach Company for having saved them a large amount in litigation expenses, and against gas consumers generally for having been the means of reducing their expenditure per mantle. But let no one fall into the mistake that we admit in any way the righteousness of Mr. Radclyffe's claim, or that he was the means of bringing about the settlement. Last week we purposely refrained from connecting his name with the promissory note, or, as he describes it, the "commission note," then published, and are pleased that it is he rather than ourselves who let "the cat out of the bag." In the previous correspondence in which he was trying to force a claim against the gas industry's guarantee fund, he carefully kept dark the fact that he was also seeking payment simultaneously in other quarters. At the top of the "commission note" which we have by us, Mr. Radclyffe's name is associated with that of a Mr. Mundler. Why? Did Mr. Mundler also help to bring about the incandescent mantle settlement? Mr. Radclyffe claims the credit as entirely his own. Then why is his name linked with Mr. Mundler's? We ask the question, but are not particularly anxious about the answer. If readers will turn to a report of a meeting of the Incandescent Trust, Limited, published in the "JOURNAL" for Oct. 15, 1901, they will find that Mr. Mundler was then the Acting Secretary for the Trust. We have another correspondent this week in Mr. A. F. Tapp, who has evidently succeeded Mr. Mundler as permanent Secretary of the Trust; and he assures us that personally he has "*no interest*" in the matter "either way," but likes to see "fair play." We need say nothing more about his disinterested letter. But as to Mr. Radclyffe's communication, our readers have now before them Mr. Livesey's circular-letter to the subscribers to the guarantee fund and a subsequent letter replying to one from Mr. Radclyffe. They have also before them Mr. Radclyffe's case from his own pen. We have perhaps been a little too patient and lenient in allowing him to occupy so much space in stating that case; and—having given him such great latitude—we think the controversy may now end so far as our columns are concerned, unless Mr. Livesey desires to reply. To that we could not, in view of the present letter, deny place; but we cannot see why Mr. Livesey should be dragged further into the matter, any more than we can see that Mr. Radclyffe has a claim on the guarantee fund. One remark more. We must emphatically protest against the unfair insertion by Mr. Radclyffe of the words "the facts as to how it has been made possible" in a sentence of ours which referred to an altogether different matter. Such a use of the sentence is certainly calculated to mislead.—ED. J.G.L.]

Gas-Works Loss at Tipton.—At last week's meeting of the Tipton Urban District Council, it was stated that, owing to the high price of coal and the small returns from residuals, the year's expenditure on the undertaking, including the repayment of principal and interest on loans, had exceeded the income by £899. The gross profit for the year amounted to £3698; but against this there had to be set a sum of £4597 for repayment of principal and interest.

Buxton Gas Supply.—At the last meeting of the Buxton Urban District Council, the Manager (Mr. H. Barker) reported that for the year ending in March last the total quantity of gas distributed was 98,567,000 cubic feet, which cost, including wages, 1s. 6·971d. per 1000 cubic feet. The cash receipts amounted to £12,164 13s. 1d., which included gas, meters, and stoves. The number of consumers was 1663—an increase of 76. Mr. Barker's salary was increased by £50 a year.

The Dalton-in-Furness Gas Question.—The latest step in the gas controversy at Dalton-in-Furness has been taken by the Urban Council. An agreement, signed in January, 1888, under which the Gas Authority were to pay to the Council 1s. per annum for every connection with the Council's mains, and 1s. for every opening of a road or footpath, has been resuscitated; and the Surveyor has been instructed to prepare a bill to be presented to the Gas Authority. It has been decided to extend the street-mains and augment the holder accommodation at the gas-works.

Stourbridge Gas Supply.—At the meeting of the Stourbridge Urban District Council on Monday of last week, the Chairman of the Gas Committee (Mr. Purkis) submitted the annual report of the gas undertaking. The report stated that in the past year the Committee had established a record in the amount of gas manufactured and sold. The make was 174,145,000 cubic feet, or an increase of 15,511,000 feet over the preceding year; and the net profit was £1139. This result, it was remarked, fully justified the reduction last July in the price of gas. The Council agreed to an application to the Local Government Board for sanction to a loan of £5000 for the erection of new purifying plant at the gas-works. It was stated that £13,000 had now been paid off the loans of the undertaking.

Derwent Valley Water Board.—At the meeting of the Board on Thursday, the Chairman (Alderman Gainsford) reported the resignation of the Clerk (Mr. James Bell) on his appointment to the office of Town Clerk of the City of London. The resignation was accepted, and the following resolution was unanimously passed: "That this Board expresses its appreciation of the ability and courtesy with which Mr. Bell has at all times fulfilled his duties to this Board during the first two-and-a-half years since its establishment, and, while regretting his loss, desires to congratulate him upon the attainment of the distinguished position of Town Clerk to the City of London, and wishes him every happiness and success." The question of the appointment of a successor to Mr. Bell was considered; and it was resolved to issue advertisements inviting applications for the position of Clerk and Solicitor to the Board, at a salary of £600 per annum—the gentleman appointed being required to give his whole time to the duties.

PARLIAMENTARY INTELLIGENCE.

GLEANINGS FROM THE COMMITTEE ROOMS.

The Fight for a Park. The Whitsuntide recess has not been followed by a brightening up of the work in the Committee Rooms; and, so far as the "JOURNAL" is concerned, there is very little to record again this week. The principal matter is connected with the question of the acquisition by the Liverpool Corporation of 6000 acres of the watershed of the Rivington reservoirs, and the decision of Mr. Bill's Committee respecting the portion of the area which Mr. W. H. Lever has stated his intention to present to Bolton for the purpose of a park. The decision regarding this park was, it will be remembered, a curious one. The Committee wanted to preserve the park for Bolton, and at the same time they desired to protect the Rivington reservoirs. They therefore gave to the Liverpool Corporation power to purchase the area of the watershed not already in their possession, excepting the portion which Mr. Lever intended to give to Bolton and a small part required to preserve the amenities of his own house. But the Committee desired that the ownership of the park should be vested in Liverpool without payment, that Mr. Lever should be permitted to lay out the park at his own expense, that the inhabitants of Bolton and the public generally should have an uninterrupted use of it for ever, that the Liverpool Corporation should maintain and manage the park, and that they should have power to carry out such works therein as may be deemed necessary for the protection of the reservoirs. All these matters were subjected by the Committee to various conditions—such as the approval by Mr. Lever or the Corporation as the case may be of the work carried out and of the bye-laws, and providing for reference to the Local Government Board. During the recess, the Corporation had framed clauses complying with the decision. But Counsel for Mr. Lever and Bolton at first refused to entertain the clauses, or discuss them, on the ground that they had only been submitted to them just before the Committee reassembled. There was a good deal of warmth shown over the matter by both sides. It was manifest that the Committee deeply regretted that an amicable understanding had not been arrived at before the return to the House; but, at the same time, they made it known that, if the clauses were not accepted either as produced or in a modified form, they would permit this part of the Bill to proceed as originally introduced. This would have meant a repetition of the long wearisome fight in the Lords. However, the Bill had to be before the Committee three days last week on this and other matters contained in it. Early in the morning of the second day there were further sharp passages between Counsel; but at a later stage it was announced that Mr. Lever had considered the proposed new clauses, and was prepared to accept them with certain modifications. The next day a little give and take smoothed over all trouble; and the Bill as amended was ordered to be reported for third reading.

The Repayment of Loans. The Swansea Corporation Water Bill, which was under the consideration of the Commons Committee on Unopposed Bills last Thursday, raised a question as to the repayment of loans. The object of the measure is to extend the period for the construction of the Cray Water-Works, to lengthen the time for the repayment of loans, and to enlarge the borrowing powers. Parliamentary authority in connection with the works was obtained in 1892 and 1898. In the first-named year, the Corporation were given 60 years for the repayment of the loans; but in 1898, through the action of the Local Government Board, only 30 years were granted for the repayment of a new loan. The promoters now sought to alter this to 60 years, as the works, being permanent, will benefit the future generation quite as much as the present. After discussing the matter, the Committee declined to reverse the decision of the Local Government Board, fixing 30 years for the repayment of the loan under the 1898 Act; but they allowed 60 years for the present new loan. It seems an anomalous thing to have these varying periods for the repayment of loans required for the same set of permanent works; and here we appear to have another example of undue interference by a Government Department.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Lords Bills read a second time and committed: Bradford Corporation Bill, Bradford-on-Avon Gas Bill, Rickmansworth Gas Bill.

Bills reported, with amendments: Liverpool Corporation Bill, Newcastle and Gateshead Water Bill [Lords], Swansea Corporation Water Bill [Lords], Swindon United Gas Bill [Lords].

Bills read the third time and passed: Deal and Walmer Gas Bill [Lords], Huddersfield Corporation Bill.

The Longwood Gas Bill and the Rickmansworth Gas Bill have been referred to a Select Committee, consisting of Sir John Brunner, Chairman, Mr. Coghill, Mr. Boland, and Mr. Fielden; to meet to-day.

JOINT PARLIAMENTARY COMMITTEE ON THE LONDON WATER BILL.

(*Lord* BALFOUR OF BURLEIGH, *Chairman.*)

Fifteenth Day—Tuesday, May 27.

On the resumption of the inquiry to-day, after the Whitsuntide recess,

The Hon. F. THESIGER made an application, on behalf of the London County Council, that the Committee should fix some day for the consideration of clause 1, and the schedule dealing with representation, as there were various persons who would have to be present when these matters came on.

The CHAIRMAN said a day could not be fixed, but a day or two's notice would be given. Probably it would not be possible to take that important discussion during the week.

On clause 18 (Provisions as to Arbitration),

Mr. PEMBER, on behalf of the Water Companies, proposed to add to sub-section 1, which appointed the Arbitrators, the following words: "The Commissioners shall sit together; but the decision of the majority shall be binding." He remarked that by sub-section 8 of the clause, it was provided that "the Court of Arbitration may act by two of their number, and notwithstanding any vacancy in their number." This, of course, would have to be struck out if the amendment were agreed to. Though the Water Companies did not object to the decision of two being binding, they thought it right that all three Arbitrators should hear the case.

Mr. FITZGERALD said he could not accept the amendment. It was intended that the three Arbitrators should sit together, and in the ordinary course no doubt they would do so; but if the amendment were inserted, it would be obligatory upon them all three to sit in every case for the whole time. If one were ill, the whole proceedings would have to be suspended till his recovery; and if towards the close of an arbitration an Arbitrator were obliged to vacate his office, this would involve the re-hearing of the whole case, and cause the parties very large expense As to the possibility of two Arbitrators disagreeing, in that event the third would have to be called in and the case re-heard; but this was a lesser inconvenience than having a whole case heard again where two Arbitrators had agreed.

Mr. FREEMAN said that the London County Council were in favour of the amendment, having in view the magnitude of the interests concerned and the complex questions involved.

The CHAIRMAN asked if the Council would object to one of the Commissioners being absent for (say) one day during an arbitration.

Mr. FREEMAN said they would not. He would not then object to the procedure in Committees of their Lordships' House, where if a member were absent he said he would read the shorthand note.

The CHAIRMAN: Do you not think you may give considerable latitude to gentlemen in that high position? I cannot conceive two of them deciding a big matter without hearing the opinion of the third.

Mr. PEMBER said he would agree to the sub-section with the proviso that they should all sit together except with the consent of the parties. He was sure there would be no objection.

The Committee having conferred together,

The CHAIRMAN announced that they would not accept the amendment.

On the application of the London County Council, assented to by the Local Government Board, sub-section 3 was amended by the addition of the words "assisting in," so as to make it read: "The Court of Arbitration may appoint . . . officers . . . for the purpose of assisting in the execution of their duties."

The next amendment was proposed by the Local Government Board, to add at the end of sub-section 3 (after "and may remove any officer or person so appointed or employed") the words, "and for the purpose of obtaining any information which the Court may require may direct any Commissioner, or any such officer or person, to hold an inquiry."

This was agreed to without opposition.

The amendment proposed by the London County Council, and accepted by the Local Government Board, to insert at the end of sub-section 3 the words, "Nothing in this Act shall authorize the Commissioners to delegate any of their judicial duties as Arbitrators," was agreed to.

Mr. FITZGERALD said the Local Government Board proposed to strike out sub-section 5, giving to the Court, or any officer thereof, the same powers as an Inspector of the Local Government Board had on holding a local inquiry under the Public Health Act, 1875. The object of the deletion was to apply in substitution thereof, at a later stage, certain provisions of the Arbitration Act, 1889, with regard to the administration of oaths, making of affirmations, the examination of witnesses, &c.

Mr. FREEMAN said there was no objection to deleting the sub-section, provided it was quite understood that the Council did not agree to the amendment to be proposed later on in its place.

The sub section was accordingly struck out. On sub section 6,

Mr. FREEMAN said the water companies agreed to accept the amendment proposed by the Council. The section ran: "Subject to the provisions of this section, the authority of the Court of Arbitration shall extend to the settlement and the determination by them, on such terms and in such manner as they, in their absolute discretion, think most just and fit, of the matters referred to them," &c. The Council proposed to delete the words from "on such terms" down to "think," and to insert words to make the section read, "the determination by them between the parties to the arbitration on such terms and in such manner as is most just and fit," &c.

Mr. FITZGERALD objected to the amendment.

The CHAIRMAN pointed out that the words "in their absolute discretion" had been already struck out.

Mr. FREEMAN said, if that were so, he could not understand the objection of the Local Government Board.

Mr. FITZGERALD said his objection was that the amendment was wholly unnecessary, as the clause was perfectly clear. The Arbitrators could only decide between the parties to the arbitration, as nothing else was referred to them, and the remainder of the amendment did not alter the Bill in any way. Apparently the word "think" was objected to; but the Arbitrators must form their own judgment of what was just and fit.

Sir E. CLARKE pointed out that the omission of the words "between the parties to the arbitration" might lead to doubt, which the Water Companies did not wish. The words were already in the clause dealing with the adjustment of the accounts.

The CHAIRMAN: Lord Crewe has put to me a question which I should also like answered. How can an arbitration be anything but the settlement of a question between those who are parties to it?

Mr. DANCKWERTS: In an arbitration between Company A and the Water Board, they may decide a matter which may affect Company B, and so on. That is not the intention. In such a case, Company B would not be heard upon the point at all.

The CHAIRMAN thought this was arguing that the Commissioners were not fit for their duty. In the second arbitration, other matters might affect their decision.

Mr. DANCKWERTS remarked that such things had happened with the most eminent of Judges.

The CHAIRMAN said the Committee were against the amendment; and it was accordingly rejected.

Mr. FREEMAN then proposed that the words "as they think" should be deleted, and that the section should read, "as is most just and fit;" and this was agreed to.

Mr. DANCKWERTS moved the insertion in sub section 7 of the words, "under this Act," so that the section ran: "Every award, order, and other instrument made by or proceeding from the Court of Arbitration under this Act shall be binding," &c. The amendment also proposed to delete the words of the sub-section which provided that "no such award . . . shall be removable by any writ or process into any of His Majesty's Courts, and the proceedings shall not be liable to be questioned by any Court by way of *mandamus*," with the proviso (not proposed to be deleted) that the Court might, at any stage of the proceedings, and should, if so directed by the Court of Appeal, state, in the form of a special case for the opinion of the Court of Appeal, any question of law arising in the course of the arbitration. The learned Counsel contended that the Court of Arbitration under the Bill would have unlimited powers to do what they pleased. Their awards, &c., were made of the same force as those of a Judge of the High Court; and the law of England was that every order made by any such Judge was deemed to be legal and within the powers of that Court merely because it was made, and it could not be questioned except upon appeal. Whenever a judicial tribunal was set up anywhere by Act of Parliament, the High Court of Justice acquired, *ipso facto*, under the ordinary law, the right to control them by various processes, such as prohibition, *certiorari*, *mandamus*, and so forth. The Committee were asked to alter that, and the only check proposed by the Local Govern- Board was a perfectly illusory one.

Mr. FREEMAN supported the amendment.

The CHAIRMAN: Time is of the essence of this matter; and if there is one party who wants to defeat the procedure by lapse of time, such a power as that proposed would be a very important help.

Mr. FREEMAN said admittedly the tribunal had to deal with the largest pecuniary transaction ever referred to arbitration, and yet the Committee were asked to take away the ordinary rights which every litigant would have in any matter, however small, referred to arbitration. It was obviously to the interest of everybody concerned to push matters on with the utmost possible expedition consistent with efficiency. There was nothing the Courts were more averse to than interfering with the decision of a Court of Arbitration, if they could possibly help it. The tribunal might refuse to state a case, or they might state it so that the party desiring it would be practically put out of Court. They wished that there should be the ordinary power to go to a Court, state their case, and ask their assistance.

Mr. FITZGERALD said his friends had forgotten that an arbitrator in an ordinary arbitration was absolute judge of the facts, and there was no appeal from his decision upon the facts. He was also absolute judge of the law, unless he stated a case for the opinion of the Court. He might be ordered by the Court to do so if they came to the conclusion that a substantial question of law was involved. This the Local Government Board had provided for in the clause. They further proposed to provide by amendment that there might be an appeal to the House of Lords from the Court of Appeal, if the latter so agreed. The general scheme of the amendments would be that the Arbitrators, both as to law and to facts, should be subject to appeal.

Mr. FREEMAN: Not as to facts.

Mr. FITZGERALD said this was how he understood the amendments. Under the proposal of the Bill, the decision of the Arbitrators as to facts was final, and this was the main object of sending a case to arbitration. Another objection to the amendments was that they might indefinitely delay the whole proceedings.

Mr. DANCKWERTS, in reply to the Chairman, said that neither the Water Companies nor the County Council desired that the Arbitrators should be put in a different position from an ordinary arbitrator, so far as the facts were concerned. It was found, however, that arbitrators did very often innocently travel beyond their jurisdiction. In such a case, these facts could not be questioned unless the amendments were agreed to.

The CHAIRMAN: In the event of the Committee rejecting the amendment, are you in favour of the amendments of the Local Government Board giving an appeal to the House of Lords with the leave of the Court of Appeal?

Mr. DANCKWERTS: In the sense that one would rather have a farthing than nothing, if one cannot have a shilling, yes.

The room was then cleared. On the re-admission of the public,

The CHAIRMAN said: There is a very even division of opinion in the Committee. The Committee feel that the powers sought for are very wide for the Court of Arbitration, and that no exact precedent has been —perhaps none can be—pleaded. On the other hand, they think the amendment as proposed might lead to a quite undue extension of time in the process, without charging anybody with deliberately wishing to do it. Before finally passing from the sub-section, the Committee would be glad if the Local Government Board and the other two parties principally interested—the Water Companies and the London County Council—would confer with a view, without unduly limiting the Court of Arbitration as to its powers, to endeavouring to make sure that any power of appeal which is given should not lead to undue protraction of the proceedings. We think, in the light of the discussion, it would not be hopeless that an agreement should be arrived at. We incline, as at present advised, to give the words "under this Act." That is the only specific amendment which can be dealt with. Under these circumstances, the particular amendment allowing appeal from the Court of Appeal to the House of Lords will stand over.

Mr. BAGGALLAY, on behalf of the Water Companies, moved to add in sub-section 8, at the end, "No Metropolitan Water Company shall be prejudiced by the decision of any question in any arbitration to which it is not a party." This was a very material point, because the inquiries could not be held simultaneously. Before Lord Derby's Commission under the Local Government Act, 1888, a number of points were laid down on the earlier inquiries, and at subsequent ones the parties were not allowed to go into them at all.

The CHAIRMAN (after consultation) said the Committee would not accept the amendment.

Mr. PEMBER said the Water Companies proposed to substitute for the words in sub-section 9 which ran, "The Court of Arbitration shall award such an amount of stock as is in their opinion equivalent to the money value of the undertaking of the Company," the following: "The Court of Arbitration shall award to each Company compensation for the transfer of its undertaking." The section proceeded, "as if, with the necessary modifications, the law of compensation for the purposes of the Lands Clauses Acts were applicable to the case," and then dealt with compulsory sale. He understood the Local Government Board agreed to this amendment.

Mr. FITZGERALD said that was so.

Mr. THESIGER said the London County Council proposed the following words: "The value of the undertaking of each Company shall be determined by the Court of Arbitration as if, subject to the provisions of this Act, the law of compensation," &c. Then the section would proceed as in the Bill: "Provided that the Court of Arbitration shall not make any allowance in respect of compulsory sale," &c. It was no more than a drafting amendment of the original proposal of the Local Government Board. It might be said that as the words "compensation for the transfer of the undertaking" had been introduced into clause 2, it was necessary to insert them in the present place. But clause 2 did not pledge the Committee to anything.

The CHAIRMAN: Why should you use the word "compensation" and not "value"?

Mr. FITZGERALD said in his humble judgment it did not matter which word was used.

Mr. PEMBER: Oh yes, it does.

Mr. FITZGERALD said there was no difference in the legal effect, and he had accepted Mr. Pember's amendment. He was quite content to leave the matter to the Committee.

Mr. PEMBER said what had to be settled by arbitration since 1845 was compensation, and compensation meant the loss to the vendor arising from having to sell his undertaking. "Value" might mean the value to the vendor or the value to the purchaser. The purchaser might bring evidence to show that the value was less to him than to the vendor. He admitted that the contrary might be shown, and had been done with considerable success on a certain famous occasion. But it would be the object of the Water Board to belittle the value of the undertaking. The word "compensation" had been used in the statute for a couple of generations, and this mean what the vendor lost —to which he was surely entitled.

The CHAIRMAN: He loses the value of his undertaking.

Mr. PEMBER: Yes, the value to himself. That is the whole point.

The CHAIRMAN said, speaking personally, he was not reconciled to striking the word "value" out of the clause. He understood the Committee had now to define what was to be the "compensation" mentioned in clause 2.

Mr. FREEMAN said they were all agreed that this was so.

The CHAIRMAN said the technical position was that the Local Government Board, in agreement with the Water Companies, proposed to alter, partly as a consequential amendment, sub-section 9. It was perfectly clear that the precise alteration to be made must be the subject of further discussion, and must therefore be adjourned.

Mr. LITTLER read a sentence from the report of Lord Llandaff's Commission which recommended that the tribunal should value the undertakings of the Water Companies at what they were worth to the vendors.

Mr. FITZGERALD suggested the following words, which might satisfy all parties: "The Court of Arbitration shall determine the sum to be paid to a Metropolitan Water Company as if, with the necessary modifications, the law of compensation for the purposes of the Lands Clauses Act were applicable to the case."

The CHAIRMAN said this could be discussed the next day.

Sixteenth Day—Wednesday, May 28.

The discussion on clause 18, sub-section 9, was resumed this morning.

Mr. FITZGERALD, in supporting the amendment proposed by him on the previous day, pointed out that the Lands Clauses Act used all the words "value," "purchase-money," and "compensation." The Act stated: "In estimating the purchase-money or compensation to be paid by the promoters of the undertaking, regard should be had by the arbitrators not only to the value of the lands to be purchased, but also to the damage (if any) to be sustained by the owner of the lands by reason of the severing of the lands from the other lands of such owner, or otherwise injuriously affecting such other lands." He had used the word "sum" because it was a neutral word, not conveying any special meaning.

Mr. BALFOUR BROWNE objected to the word suggested. He stated that the Lands Clauses Act had been subjected to judicial interpretation from time to time; and the meaning of the words used in it was known. The Chairman had put the matter very clearly on the previous day—that the vendor lost the value of his undertaking; and Mr. Pember added: "He loses the value of the undertaking to himself. That is the whole point. He does not lose it as it might be to the purchaser." That was quite right; but there, again, the interpretation of the Lands Clauses Act came in. It had been held over and over again that the "value" was the value to the seller. One need not go beyond the word "value" for that purpose.

The CHAIRMAN: We want to make sure that that interpretation shall be put beyond doubt.

Mr. BALFOUR BROWNE quoted the judgment of Lord Chief Justice Cockburn in *Stebbing v. Metropolitan Board of Works* to prove his contention.

The CHAIRMAN suggested the use of the term "value to the vendor."

Mr. BALFOUR BROWNE said those words were not in use; and it would be argued hereafter that the Committee, in employing them, had some intention beyond the ordinary law.

Mr. PEMBER said although he would prefer the form of words he

originally moved, yet as Mr. Fitzgerald's suggestion would achieve the result he had in view, he would accept them. The Water Companies only wanted legal compensation—the law as if the Lands Clauses Act were applicable.

Mr. BALFOUR BROWNE urged that the words "value of the undertaking" should be used.

The CHAIRMAN: As I understand, everyone is agreed as to what is required. What we want to give is the value of the undertaking to the vendor. We are told it is unwise to put those words in because they are not the subject of judicial interpretation. We are also told that the word "compensation," as legally defined, is the same thing as the value to the vendor. There is a prejudice in the minds of some members of the Committee against the word "compensation" appearing here. It has been accepted by the promoters of the Bill, who are the only people who can give us skilled legal advice; and therefore we are in a difficulty. The Committee would, I think, unanimously take the words "value of the undertaking to the vendor."

Mr. DANCKWERTS cited cases to prove his contention that, by the word "compensation," the Water Companies would get nothing beyond that which they had lost by the Bill taking it from them.

Mr. FITZGERALD, replying to the Chairman, agreed with Mr. Balfour Browne that "value of the undertaking to the vendor" would probably lead to a contention on the part of counsel hereafter that the law was meant to be altered in some way. Perhaps the use of the word "purchase-money" instead of "sum" would meet the difficulty.

The CHAIRMAN asked if "value of the undertaking" would be satisfactory.

Mr. LITTLER said the Kent Company had an inexhaustible supply of water. It might be contended, under the word "value," that, in assessing the number of years' purchase, they were only to receive the same value as a Company who had nearly come to the end of their supply.

Mr. DANCKWERTS contended that ambiguity would arise.

Mr. FITZGERALD said he thought the words would do ample justice to all parties.

Mr. PEMBER: Do your Lordships mean the Water Companies to have the value of the undertaking as to themselves?

The CHAIRMAN: I understand that to be so.

The room was then cleared. On the re-admission of the public,

The CHAIRMAN said: The Committee will adopt the words "value of the undertaking;" but we have thought it necessary to make sure, to the best of our ability, that this clause shall run in conformity with clause 2, and therefore that would be an argument in favour of the words "sum to be paid." But, to meet the drafting difficulty, we propose the following: "In fixing the sum to be paid by the Water Board as hereinbefore provided, the Court of Arbitration shall determine the value of the undertaking of each Metropolitan Water Company as if, with the necessary modifications, the law of compensation for the purposes of the Lands Clauses Act were applicable to the case."

Mr. LITTLER then moved an amendment by the Water Companies, to insert that the Court might make such allowance as they thought just for "recoupment for any loss that may arise in finding an equally good investment, yielding the same income, as well as for the cost of re-investment, and for" (continuing as in the clause) "covering any expenses incurred," &c.

Mr. FITZGERALD said the Local Government Board did not object to the principle of the amendment; but they did object to the way it was worded. He proposed the following words: "Any loss of interest pending re-investment, as well as for the cost of re-investment;" and then the point with regard to expenses incurred by the passing of the Act would follow. The words "recoupment for any loss which may arise in finding an equally good investment yielding the same income," were far too precise, and would tie down the Arbitrators. What they ought to give was interest for a reasonable time in finding a new investment.

Mr. THESIGER said the London County Council cordially agreed to the proposal of the Local Government Board.

The CHAIRMAN: The Committee accept the amendment as suggested by the Local Government Board.

Mr. THESIGER proposed the following amendment by the County Council, to be inserted at the end of sub-section 9: "In any case in which any such allowance is claimed, the items in respect of which such allowance is claimed, and the amount claimed in respect of each item, shall be separately claimed, and the Water Board shall be heard thereon; and if any such allowance is made, the items in respect of which the allowance is made, and the amount allowed in respect of each such item, shall be separately stated in the award." He said the County Council desired that the Water Board should know distinctly what claim was going to be made by each of the Companies in respect of those various extra items.

Mr. PEMBER and Mr. FITZGERALD objected to the amendment.

Mr. PEMBER, on sub-section 10, then moved an amendment, on behalf of the Metropolitan Water Companies, to add the words to the clause here printed in italics: "The *full* costs of any Metropolitan Water Company, *as between solicitor and client*, incurred in an arbitration under this Act shall . . . . be borne by the Water Board," &c. Before asking the Committee to consider the details of the amendment, he wished to get an expression of their view on the point of principle.

The CHAIRMAN: The real question is whether it shall be costs as between solicitor and client, is it not?

Mr. PEMBER said that any question of detail might be arranged if a declaration of principle were given. He assumed that the Committee would desire that all costs, charges, and expenses to which the Water Companies were fairly and properly put in consequence of having to sell their undertaking, whether directly or indirectly connected with the arbitration, should be borne by the purchasers—in other words, that they should have the compensation money for the value of the undertaking clear. There were three grades of costs of which taxing masters took cognizance—costs between party and party, which were reduced to the lowest possible sum; costs between solicitor and client, which was a higher grade; and then costs as between solicitor and his own client, which was the largest allowance of all. Unless special words were inserted, the only costs allowed would be between party and party. If it were thought he was asking too much, he would agree to the insertion of the words at the end, after "the Court may order the taxation of any costs in such manner and on such scale or principle as they may think fit, and such costs shall be taxed by a Master of the Supreme Court."

Mr. FITZGERALD agreed to the latter amendment as now put.

The final settlement of this point was postponed, in order to allow Counsel to agree.

The question of whether Tottenham and Enfield should have the costs of the arbitration as a matter of course, notwithstanding that they were willing vendors, and, in fact, forced the Water Board to purchase them, was allowed to stand over.

Mr. PEMBER pointed out that the reason they asked to be purchased was because it was forced upon them.

Mr. FITZGERALD, on sub-section 11, then proposed the insertion of the following words at the commencement: "The provisions of the Arbitration Act, 1889, relating to (*a*) the administration of oaths and the taking of affirmations, (*b*) the correction in an award of mistakes and errors, (*c*) the summoning, attendance, and examination of witnesses, and the production of documents, and (*d*) false evidence, shall apply to arbitrations under this Act, and also (except with regard to the correction of mistakes and errors in awards) to inquiries held under this section; but, save as aforesaid, the" (then followed the original sub-section) "the Arbitration Act, 1889, shall not apply to arbitrations under this Act." This was in substitution of sub section 5, which was deleted by the Committee on the application of the Local Government Board, because it was considered that the provisions of the Arbitration Act, 1899, were more appropriate than those introduced in sub-section 5.

Mr. DANCKWERTS objected, on behalf of the Water Companies, to the last words, excluding the operation of the Arbitration Act except as provided.

The CHAIRMAN: The amendment of the Local Government Board is agreed to by the Committee.

Mr. BAGGALLAY moved to insert in sub-section 11 the words: "The Court of Arbitration shall include in the compensation to each Company such sum as shall fully indemnify the Company against all costs, charges, expenses, and payments whatever incurred or made by the Company in consequence of, or incidental to, the passing of this Act, the transfer of the undertaking of the Company, the carrying on of the undertaking until dissolution, and the dissolution or winding up of the Company, so far as the same are not expressly provided for by this Act." Counsel pointed out that the proposed sub-section dealt with a class of expenses which must be thrown upon the Companies in consequence of the transfer.

Mr. FITZGERALD said that the words of the Act were quite sufficient: "The Court may make such allowance as they think just for covering any expenses incurred." It was right that the Court should have the fullest discretion to deal with all those matters; whereas the amendment was of the widest character. He did not know what could not be brought in under it.

The amendment was rejected.

Mr. LITTLER, on the proposed sub-section 12, moved the following: "The Court of Arbitration shall commence its sittings within six months after the passing of this Act, and shall proceed with the arbitration so as to make, as far as possible, all its awards before the appointed day." The Companies did not wish to be left at the discretion of the Local Government Board.

Mr. FITZGERALD said the objection was that it was quite possible that six months would not be sufficient time.

Mr. LITTLER, in answer to the Chairman, said he was prepared to make the term nine months.

This was agreed to.

The Committee then renewed the discussion on the amendment of the Companies on sub-section 10, as modified by Mr. Pember.

The CHAIRMAN asked if an agreement had been come to on the lines which had been consented to by the Local Government Board.

Mr. PEMBER said he agreed to it, and had nothing further to say.

Mr. LITTLER, who appeared for the Kent and Southwark and Vauxhall Companies, contended for the original proposition—namely, that costs should be given as between solicitor and client, and not left to the Court.

It was ultimately agreed to include the words: "The Court may order the taxation of any costs in such manner, and on such scale or principle, as they think fit."

The question on sub-section 7 as to appeal to the High Court was still further postponed, the Chairman stating that it raised large issues. This was the only part of clause 18 left over.

Mr. FITZGERALD said it would be a great convenience if the Water Companies would authorize one of their Counsel to meet Counsel for the Local Government Board for the purpose of agreeing to a form of the sub-section.

Mr. PEMBER did not think the Companies would authorize one Counsel to represent them all; but suggested that the junior Counsel, who had had the matter under consideration, might meet and arrange matters.

The first amendment on sub-section 1, clause 19 ("Subsidiary powers of the Water Board") was a combined one of the Local Government Board, the Colne Valley Water Company, and the Tottenham Urban District Council, to leave out the following words giving power to the Water Board "to acquire, purchase, or take on lease or exchange any lands or any easements or rights over or in land, whether situate within or without the limits of supply."

This was not opposed; and was agreed to by the Committee.

Lord ROBERT CECIL, on behalf of the Hertfordshire County Council, moved to insert, after the power "to acquire, hire, &c., such buildings as they may require, whether within or without the limits of supply," the following proviso: "Provided that nothing in this section shall authorize or empower the Board to acquire any water-works or wells, or to use any lands or easements, or any rights in or over lands, acquired under the powers of this section, for the purpose of obtaining water for public supply."

This was supported by the County Councils of Berkshire and Wiltshire, and was agreed to by the Committee.

The amendment of the Local Government Board, to insert, as sub-section 4, the following: "The Superannuation (Metropolis) Act,

1866, shall apply to the Water Board as if the Board were an authority," was agreed to.

Clause 19, as amended, was agreed to.

On clause 20 ("Power of the Local Government Board to make Provisional Orders for certain purposes"),

Mr. BALFOUR BROWNE moved an amendment on behalf of the Barnet District Gas and Water Company, which was supported by the London County Council and the County Councils of Berkshire and Wiltshire, to strike out the latter part of sub-section 2, which gave power to the Local Government Board, on the application of the Water Board, to repeal any enactment relating to the Water Companies, &c.

This was agreed to.

After some discussion, it was agreed not to strike out sub-section 3.

Clause 20, as amended, was agreed to.

Seventeenth Day—Thursday, May 29.

At the commencement of the proceedings to-day, clauses 21 and 22 were passed over.

Mr. FITZGERALD then opened the discussion on an amendment by the Water Companies on clause 23, which provides for the dissolution of a Company when it shall have applied and distributed the water stock issued to them. He said there was an amendment to substitute for clause 23 a new clause, sections 1 and 2 of which were as follows: "(1) As soon as the compensation due to any Metropolitan Water Company shall have been duly paid or satisfied to such Company in accordance with this Act, the Company shall, by virtue of this Act, enter upon a liquidation of its affairs, and, upon the conclusion thereof, be dissolved in manner provided with respect to the Company in the fifth schedule of the Act. (2) This section shall not apply to the New River Company or to the Staines Reservoirs Joint Committee." He would accept the new clause with a very slight alteration; the words "by virtue of this Act" had been inserted in the wrong place. The company did not enter into liquidation by virtue of the Act.

Mr. LITTLER thought the best plan would be to omit the words.

Mr FITZGERALD said, with regard to sub-section 2, the Staines Reservoirs Joint Committee was appointed by three Companies; the Committee itself had no share capital. They were not entitled to make any profit; they only had powers of borrowing, and the Staines reservoirs were vested in them. He thought the Staines Reservoirs Joint Committee should be excepted from that clause. However, he would leave the clause as at present; but he wanted it to be understood that they wished to bring a special clause hereafter to deal with the special case of the Staines Reservoirs Joint Committee. Sub-section 3 provided that "the several powers and provisions contained in the several Special Acts of the Metropolitan Water Companies shall remain and be of full force, as regards the Companies respectively, so far as the same are necessary or required for the purposes of any Company up to and until the dissolution thereof." This seemed to him to be rather wide; and he suggested that the words "for the purposes of the liquidation of any Company" should be substituted for the words "for the purposes of any Company." Counsel, after the lapse of a few moments, said there seemed to be an opinion of the representatives of the Water Companies that it might unduly narrow the clause, so he would not press the point.

The Committee accepted the clause, and clause 24 was passed over.

Lord ROBERT CECIL supported the amendment of the Hertfordshire County Council to clause 25. The amendment proposed the insertion of "or Provisional Order" after "Bill," and "or applied for" after "promoted." The clause ran: "Nothing in this Act shall affect the right of any Council or other authority represented on the Water Board to be heard against any Bill promoted by the Water Board." He said the Hertfordshire County Council would be represented on the Water Board, and they were anxious that their being represented there would not prevent them being heard against any proposal of the Board. The only question was whether it was sufficiently clear at present, or whether there should be inserted the words proposed by the Hertfordshire County Council to make it perfectly clear.

Mr. FITZGERALD said it was quite clear that the Council would be entitled to be heard; but the only ambiguity was that, while it gave power to appear at an inquiry by the Local Government Board, it did not give power to be heard at the confirming of the Provisional Order which might be granted.

Lord ROBERT CECIL said there was a possibility of their not being heard; and he did not think it could do any harm to make it quite clear that they should be heard.

Mr. LITTLER supported Lord Robert.

The CHAIRMAN: It would be best to make it quite clear.

Mr. PEMBER here interposed, and referred to the new clause to be substituted for clause 23. He said it was not intended that the whole clause should not apply to the New River Company; and he asked that sub-section 1 only should not apply to the New River Company or to the Staines Reservoirs Joint Committee.

The CHAIRMAN: I have no objection.

At the instance of the Local Government Board, the words "or confirming any Provisional Order made under this Act" were added at the end of clause 25.

Sub-section 2 came in for a good deal of discussion. The wording was as follows: "The expression 'undertaking' includes, in the case of any Metropolitan Water Company, all such property, real and personal, including cash balances, reserve funds, investments, and all other interests and rights in, to, and out of the property, real and personal, and obligations and things in action as may be in possession of the Company, or belonging to them, immediately before the appointed day, and all books, accounts, and documents relating thereto." An amendment by the Water Companies was first of all accepted—that after "Company" there should be inserted "all rights of taking, distributing, and supplying water, and all other their rights, powers, authorities, and privileges and."

Mr. LITTLER then introduced a further amendment, from the same source, to leave out "cash balances, reserve funds, investments, and;" and after "all" to leave out the word "other." He said it was simply to provide that all the cash balances, reserve funds, and investments should be left in the hands of the Companies. He did not know that there was any objection to it, because it was no part of the undertaking at all, and would make no end of confusion. In addition to that, it would leave the Companies without any money to go on with. The same with regard to the reserve fund. If it was so many thousand pounds, and they kept it, the Water Board would not pay them for it. If it was transferred to them, the Board would have to pay sovereign per sovereign for it. His Lordship would remember that all these things were not capital at all; they were matters relating to the *corpus* of the Company.

Mr. THESIGER said the County Council strongly objected; and he did not think Mr. Littler had put very clearly what the conditions of the clause were. After quoting freely, Counsel said that, with regard to the "undertaking" of the Companies, they were going to be taken over as a going concern. Let them consider the case of the West Middlesex Company at the present moment. They were now paying a dividend at the rate of 10 per cent. As they had paid all their back dividends, there was also a rebate of a certain amount to the consumers; and they also had a reserve fund. Their net income would no doubt be their 10 per cent. (there were no back dividends); and upon this value all their undertaking would be estimated. The reserve fund was part of the undertaking which would be taken over by the Water Board. Of course, that reserve fund had no doubt been built up out of moneys which the Company might really have expended—in a further rebate to the consumers. For these reasons, it would be preposterous, having taken over the concern, to pay back part of the undertaking into the Companies' hands.

Mr. FITZGERALD said the funds which were provided out of profits in excess of the statutory dividend were held by the Companies subject to certain statutory rules, and could only be divided in certain events. The West Middlesex Company had a reserve fund which amounted, he believed, to £70,000, or a little more. They could not divide that amount among their shareholders, because their ordinary revenue was more than sufficient to pay their dividend. They were obliged to hold that fund in hand to meet certain specified events, if such events should arise. The interest from the fund went into the general revenue of the Company; and as the general revenue of the Company was more than sufficient to pay the statutory dividend, the interest of that fund went to reduce the price of water. It must never be lost sight of, in dealing with these statutory Companies, that when once they reached the point that they could pay their statutory dividends and their back dividends, the surplus profits did not belong to them, but to the consumers of water. A very great injustice would be done to the consumers if they allowed that amendment. The Company might make a claim for the £70,000 before the Arbitrators; but he did not see that they could succeed, having regard to the statutory restrictions under which that fund was placed. The Airdrie and Coatbridge Company were in much the same position; and he contended on similar lines as at present. But the Arbitrator, he believed, had not yet made his award. In conclusion, he said that where they were dealing with eight Companies, it was only possible to deal with them by a general clause.

Mr. LITTLER suggested that the words "cash balances" and also "investments" should be struck out, and that they should leave in "reserve funds within the meaning of the Water-Works Clauses Act, 1847." He was authorized by the West Middlesex Company to say they were quite content with that; and he did not think there was any other Company in the same position.

Mr. FITZGERALD said he could not accept that.

The CHAIRMAN: No; we will not take this amendment.

Mr. MOON raised the questions of unclaimed dividends and books of account. Surely they must retain the unclaimed dividends, which they might be called upon to satisfy.

Mr. FITZGERALD: We take over the whole, including unclaimed dividends.

Mr. MOON said that, if they looked at clause 32, they would find that it did not give them the money which would be required to pay the dividends of the Companies on "the appointed day." They required to retain moneys in hand on revenue account up to "the appointed day," and they would have to pay dividends to their shareholders out of the moneys received on revenue account. The Water Board were not bound to pay their dividend, except from "the appointed day."

The CHAIRMAN: That would come in the award.

Mr. LITTLER: Yes; but you will see that if we had to wait for the award before they could get it, they would be crippled.

The CHAIRMAN said it seemed to him that the difficulty would never arise if things were properly guided.

Mr. LITTLER said he did not know that it would never arise.

Mr. MAY, Solicitor to the Lambeth Water Company, said that, as the Bill was at present framed, what would happen would be that on "the appointed day" they would hand over to the Water Board everything they possessed—their cash balances, all revenue, everything. Supposing "the appointed day" was Oct. 1, and, as in his Company's case, the accounts were balanced up to Sept. 30. In due course they would hold a meeting, and in the following January they would have declared a dividend in respect of the period which ended on Sept. 30. Under the Bill, they would not have a farthing with which to pay the dividend; their cash balances would have gone. It was quite true that they would ultimately get compensation for the balance that was taken over; but that would be at the end of (say) two or three years, when the arbitration was completed. In the interval, their shareholders would not get a farthing for the half year ending Sept. 30.

Mr. FITZGERALD said the whole difficulty would be met by the Water Board paying the dividend.

The CHAIRMAN said this ought to have arisen on clause 32. He was sure the Committee would say that there should be no breach of the continuity of the dividends. It did not matter whom the shareholder got the dividend from, so long as he got it at the proper time.

Counsel expressed satisfaction at his Lordship laying down this principle; and the question was postponed.

Mr. FITZGERALD said there was a special clause about the New River Company; and he thought it would be better for all the provisions of this Company to go into one special clause.

The CHAIRMAN said they had better get the clause printed before they came to it.

Mr. *Daniel Hill* then gave evidence as to the different classes of

books of the Companies, and said that they would require the share register, and so on, when they paid the dividends. The accounts of the water-rate would no doubt be wanted by the Water Board; and there was no reason why they should not be handed over. Roughly speaking, the Companies would require the capital accounts, and the Water Board the revenue accounts.

The Companies proposed that clause 26 should be further amended by making "the appointed day" Dec. 31, 1904, instead of Jan. 1, 1903.

Mr. LITTLER said that, as the arbitration might not begin until nine months after the passing of the Act—which would mean June of next year—the clause, as at present constructed, was suggesting an utter impossibility.

Considerable discussion followed as to what date should be fixed; and eventually the Committee decided to make Dec. 25, 1903, the appointed day, "or such other date, not being more than eighteen months later, as the Local Government Board may appoint."

On clause 30 being reached,

Mr. MOON again raised the question of books. He said that clause did not give them power to retain the books necessary for the purpose of winding up the Company.

To grant this power, the Committee agreed to insert the words "and to wind up their affairs and dissolve the Company."

In clause 31, which provides for the inspection of a Company's books by any person authorized by the Water Board, the Companies sought to insert the words "for the *bonâ fide* purposes of the arbitration under this Act;" but the amendment was refused.

The Committee afterwards dealt with amendments to clause 32.

LEGAL INTELLIGENCE.

Question as to Lighting a "Refuge."

At the Westminster County Court, on Friday, the case of *Codrai v. The City of Westminster* came before his Honour Judge Woodfall. The plaintiff was a cab proprietor of Kennington Road, and he claimed £33 9s. 6d. damages sustained through a cab being wrecked in Whitehall. It ran on to the refuge in the small hours, the driver not seeing it because the lamps on it were not alight; and this was the alleged negligence of the Westminster Council. Mr. Jenkins, for the defence, argued that, under the Metropolis Management Act, a Local Authority had the option of lighting or not. The Kitson Light Company had been experimenting, with the consent of the Council, on this refuge, and had been requested to take their lights away. The work of removal was in progress at the time of the accident. He cited a case against the old Islington Vestry, where the public lamps had been extinguished before daylight, and a cab ran on to a refuge. It was there held that the Local Authority had exercised their legal option under the Act mentioned, and consequently the cab proprietor could not recover damages. His Honour distinguished between exercising the option of turning out the lights and not having lights at all at a spot where it had been thought necessary to have them, which was shown by the fact that the Council had had lights there. He now said he intimated at the trial to Mr. Lincoln Reed, the counsel for the plaintiff, that he was with him on the facts, and would reserve his decision on the points of law. The defence on the facts was that the driver of the cab was guilty of contributory negligence, as he must have seen the refuge had he not been looking behind him at the time. He (his Honour) had been and seen the spot many times, and in different lights; and nothing would persuade him that a driver who was looking could fail to see the refuge. He must give judgment for the defendants. Counsel for defendants, in response to a question from the Judge, said, as representing a great public body, he must ask for costs; but he thought it likely the Council would forego them. The legal points were, of course, not gone into.

Prepayment Meter Robberies.

At the West London Police Court on Saturday, Thomas Webb, potman, and G. M. Carter, van driver, were finally examined on the charge of being concerned with another man (who is now undergoing a sentence of four years' penal servitude in respect to another offence) in stealing money belonging to the Gaslight and Coke Company. The prisoners called at houses, and representing themselves as servants of the Company, requested to be allowed to examine automatic meters. They robbed the meter-tills of the contents, and left with the money. The prisoners were committed for trial.

Charge for Water Supply to Builders.

At the Ilkeston County Court last Tuesday, William Holmes, a builder, of Ilkeston, sued the Corporation for the sum of £2 6s., being money which the plaintiff alleged was paid under protest with reference to the supply of water in connection with the carrying on of his business as a builder. Mr. Holmes had always been charged the sum of 10s. per house for the supply of water by the Corporation. In April last, he was contemplating building six houses, and came to the Town Hall to pay his fee. Instead of the usual £3, he was informed that he would have to pay £5 6s., as the rates had been raised. He paid the extra money under protest, and now sued for its recovery. The Borough Surveyor had raised the price of water; and his action had been confirmed by the General Works Committee, who passed a resolution to the effect that the price to be charged for a supply of water for new buildings should be 2d. per square yard for a roofed site. His Honour held that the Corporation were bound by their resolution. It had been explained that the resolution was intended to convey that 2d. would be charged for every square yard of the floor—that was to say, if the site of the building was 50 square yards, and there were two floors, then they would be able to charge for 100 square yards. Unfortunately, the resolution as drafted did not convey this meaning, but stated that the price to be charged was 2d. per square yard of roofed site. There would be a verdict for the plaintiff for £2 6s., with costs.

MISCELLANEOUS NEWS.

THE PURCHASE AND WORKING OF GAS UNDERTAKINGS.

At the Annual Meeting of the Rural District Councils Association, held at the Westminster Palace Hotel on Wednesday, under the presidency of Sir EDWARD STRACHEY, M.P., the Executive Committee's report stated that:

The question of rural district councils purchasing and working gas undertakings has been brought to the notice of the Association through the instrumentality of the Isle of Wight Rural District Council. This difficulty arises from the fact that an urban authority have no power to maintain and carry on a gas undertaking except in pursuance of a Provisional Order under the Gas and Water Works Facilities Acts, which are inapplicable to a rural district council. The Isle of Wight Rural District Council suggested to the Local Government Board that the Gas and Water Works Facilities Acts should be made applicable to rural district councils; but the Local Government Board replied that there was not such a general desire among rural district councils to have the power to purchase gas undertakings as would justify the introduction of a Bill on the subject. The question appears to the Executive Council to be one of considerable importance; but if the anomaly, which undoubtedly exists, is to be removed, united action, as suggested by the Isle of Wight Rural District Council, will be necessary.

Speeches were made by delegates from the Isle of Wight, who explained that the question arose in the island in this way: A very important district was very badly in need of water, which was under the control of a Company. This was not altogether satisfactory to the District Council, who went thoroughly into the matter; and they thought no difficulty would arise with the Local Government Board. Unfortunately, the Board were unable to grant the powers to purchase the gas-works, which were part and parcel of the water undertaking. They felt that to purchase one was essential to purchasing the other, as they were worked together. The Board refused the necessary powers on the grounds that the Rural District Councils throughout the country had made no serious attempt to secure lighting privileges, and, consequently, they were unable to grant the power to purchase the undertaking jointly with the gas. The District Council moved all possible machinery, obtaining favourable expressions of opinion from the County Council and many District Councils; but all to no purpose. They now appealed for the support of the Association.

A resolution having for its object the removal of the anomaly was unanimously carried.

BIRMINGHAM CORPORATION GAS, WATER, AND ELECTRICITY SUPPLIES.

Annual Reports before the Council.

At the Meeting of the Birmingham City Council last Tuesday, the reports of the Gas, Water, and Electricity Committees were presented. The gas accounts were noticed in the number of the "JOURNAL" for the 20th ult. (p. 1365).

GAS COMMITTEE.

Mr. HALLEWELL ROGERS, in submitting the report of the Gas Committee, moved the appropriation of £30,557, being the net profits of the department for the year ended March 31, to the credit of the improvement rate of 1901-2. He briefly recounted the principal circumstances bearing upon the year's trading. It would, he said, be remembered that from September, 1900, the price of gas was raised only 3d. per 1000 cubic feet, instead of 5d. or 6d., which the increased price of coal then warranted. The accounts now submitted represented the first full year's trading with the increased price. Coal was purchased during the year upon somewhat lower terms; but the cheaper supplies only dated from July 1 last, and it was obvious that, having to use the higher-priced coal in the earlier months, the present year's accounts were not a fair test of the capabilities of the gas undertaking. The good result shown had, indeed, only been obtained by the exercise of the most economical management and the delay of all expenditure except that which was absolutely and immediately necessary. This had enabled the Committee to fulfil their promise to provide a sum in aid of the improvement rate of last year amounting to £30,557, after paying for all interest and sinking fund charges on the capital funds of the undertaking. In addition to this cash contribution and the interest of £4000 received from the investment of the reserve fund, which had already been paid over, the department were entitled to take credit for indirectly aiding the rates of the city and district to the extent of £18,400, by supplying gas at a low rate for public lighting—making altogether a contribution equal to nearly 6d. in the pound on the improvement rate. The revenue account showed that the total expenditure last year was £715,000, or £60,000 less than in the previous year; and the income from gas was increased by £52,000—being £686,000 against £634,000. These figures showed a total saving of £112,000; but, on the other hand, there was a reduced income from coke and residuals of £77,000, reducing the net gain on this account to £35,000 as compared with the previous year. In the reduced expenditure coal was responsible for £43,500, and repairs and maintenance of works for £21,000. The increased income from the sale of gas was due to the higher charge to the extent of £24,000; while £28,000 was due to the increased consumption. The average price charged for gas during the year was 2s. 3·84d. per 1000 cubic feet; and over 541,000 tons of coal were used in manufacture. Against the increased income from gas had, as already mentioned, to be set a reduced income from residuals of £77,000, of which £70,000 was attributable to coke and breeze—prices having fallen nearly 50 per cent. owing to the large stocks of coke held all over the country and to the general decline in trade experienced in the year 1901. Tar also showed a loss of £6600 owing to a decrease in market value, but present prices indicated a more favourable return during the current year.

The resolution was seconded and carried.

Mr HALLEWELL ROGERS next submitted draft clauses for inclusion

in the next General Powers Bill. Moving the approval of these *en bloc*, he said they were identically the same as those so ably argued for by the Lord Mayor last year. The Gas Committee were, he believed, the one Committee who in this association could adopt the historic words of Mr. Chamberlain: "We withdraw nothing, we qualify nothing." With regard to powers for the extension of works, he would remind the Council that since 1876 there had been only one year—1894—in which there was any decrease in the quantity of gas sold as compared with the previous year; and in the whole period from 1876 to 1901, the output had increased 4¼ per cent. per annum compound. If the present rate of increase were maintained, the output would be doubled in less than twenty years. At the existing works in the city there was only sufficient room for the erection of additional coal-gas plant equal to an output of 6 million cubic feet per day, or not quite 20 per cent. of the present capacity of all the works. The Council would, therefore, see that it was absolutely necessary to have their land at Birches Green legalized for the manufacture of gas as early as possible, especially when it was remembered that it would take at least four or five years to prepare the ground and erect new plant. The estate already acquired by the Corporation contained 108 acres, and on the purchase money was yielding in rentals a return of over 3¼ per cent. per annum; so that until required the purchase involved no loss to the Corporation. With respect to the sum of £500,000 which it was proposed should be included in the Bill, this was the joint estimate of their Engineers for a plant capable of producing 10 million cubic feet per day. The Committee now only sought to obtain authority to raise the money when necessary; and they would secure the sanction of the Council before commencing the building of the new works.

The proposed clauses were approved without dissent, and sanction was also given to the purchase from the Bloxwich Charity Trustees of a strip of land on the east side of the Birches Green Estate, for the sum of £2500.

Mr. Hallewell Rogers submitted a further motion to the effect that on the retirement of Mr. Charles Hunt, on Oct. 1 next, Mr. Henry Hack be appointed Engineer-in-Chief of the Gas Department, at a salary of £1600 per annum. He explained that the Committee had taken the best advice, including that of Mr. George Livesey, the Chairman of the South Metropolitan Gas Company, and who was the acknowledged authority on gas-works administration. In no other similar undertaking were there two Chief Engineers. At present, the Committee had five works, each in charge of a Superintendent; two (Windsor Street and Adderley Street) being under Mr. Hunt, and the other three (Saltley, Nechells, and Swan Village) under Mr. Hack. It was proposed in future to give the Superintendents the title of "Works Engineers;" and they would take much of the detail work now done by their seniors. In addition, the Committee would appoint to one of the large works—probably Windsor Street—a more experienced Works Engineer, whose services they were advised they could obtain at a commencing salary of about £600, and who would be able to give advice and assistance in the absence of the Chief. The Committee had the fullest confidence in Mr. Hack, who had designed and superintended the erection of the works at Saltley and Nechells, involving during the last five years a capital expenditure of over £500,000. They considered the salary of £1600 a fair one in itself, and in comparison with the salaries paid elsewhere.

The motion having been seconded,

Mr. Walthall protested against the proposal, which seemed to him to be giving Mr. Hack an increase of £400 a year for doing practically the same work. He should vote against the resolution.

No other member dissented; and the resolution was carried.

The report of the Committee was approved.

Water Committee

Alderman Lawley Parker, in proposing the approval of the report of the Water Committee, said that in the accounts for the past year there were one or two favourable and one or two unfavourable items. The first favourable item was that there was a decrease of £3022 in pumping expenses, which was mainly due to the reduction in the price of coal. The second was an increase of £10,516 on the water-rental, which was equal to 4 36 per cent. But it should be observed that this included the increased charges arising from reassessment. There was, however, a normal increase of 2·97 per cent. in the water-revenue, after deducting this. Passing to the unfavourable items, there was one very serious one, which was an increase in the rates and taxes, which amounted to £11,321, due to the reassessment of the city and Aston and part of Handsworth; and it would be seen that, while they derived some benefit from the reassessment by an increased water-rental, they stood to lose between £9000 and £10,000 on the reassessment. Another item on the debtor side was the sum of £3774 paid to the East Worcestershire Water-Works Company for water during the year; but it would be remembered that this had been reported as a necessary step to enable them to supplement their water supply, and provide for the higher districts. It about covered the increased demand they had received during the year; and it had been of great service. The net result of the revenue account was a credit balance carried forward to the profit and loss account of £142,957. But this was turned into a debit balance on the profit and loss account of £65,119, arising from the charges for interest and sinking fund. At the end of the previous year, the debit balance was £32,737. This £65,119 was carried on to the special water fund account—a fund which the older members of the Council would remember was created for the purpose of meeting the deficiency out of surplus profits during the past few years. The special water fund, having been debited with that amount, stood at £34,697; and the Water Committee estimated that this sum and the £50,000 reserve fund would about suffice to meet the deficiency on the current year, and that in the next and future years the deficiency must be a charge upon the rates. Proceeding to speak of the consumption of water, he said the increase was equal to 4·12 per cent. over the previous year, or a little over half-a-million gallons—about the amount that they had obtained from the East Worcestershire Water Company. The strain in the past summer was relieved by the occasional rains, which saved them from resorting to an intermittent supply. Though it was a dry year, they came out better than they expected, owing to the rain falling at the right time. He only hoped that they might be equally fortunate in the two years that lay before them. While he was on this subject, he thought that the Council would like to know the views of the Committee as to the probable date when they would be able to have the Welsh water. He would like to say that, before the necessity for rough filtration in Wales became a necessity, the Water Committee quite hoped that this summer would be the last before the Welsh water was available—in other words, they would have the water from Wales in the summer of 1903. Unfortunately, they now saw that another summer would have to elapse before they obtained that supply, as, though work was being carried on night and day at the filter-beds in the valley, they could not hope to get the water before the summer of 1904. As he had already explained, each year's increased demand amounted to at least half-a-million gallons per day; and they had no other local source from which they could obtain an additional supply. Longbridge was a disappointment to them; for on driving their heading, instead of getting more water, they had only succeeded in getting less, owing to the inroads of the sand preventing them pumping to the bottom of the well. These things combined made the position for the next two or three summers a very anxious one, and justified him in saying that there never was a need for greater economy than there would be during the next two years. For this reason, he could, he was sure, appeal with confidence to the consumers for the same consideration they had shown in the past, or even more, so that the Committee might be able to carry through without resource to an intermittent supply. Alderman Parker next congratulated the Council on the passing of the Water Bill without any material alteration. The value of the Bill, he said, was best demonstrated by the following facts: Had the financial clauses of the Bill not been passed, the Water Committee considered that the rate for the next year would have been 1s. 1d. in the pound, decreasing by slow degrees from year to year. Now there were two factors which were matters of estimate for the present. The first was the increased water-rental from year to year, which after all, they had to estimate, because they could not tell what it would be. The second was the working expenses of the department. Under the new scheme of assessing these at a reasonable amount, the Water Committee hoped that a uniform rate of about, but not less than, 4d. would suffice. It should be borne in mind that they had to spend £2,000,000 more money than they anticipated, and that the 4d. rate would not by any means meet the interest and sinking fund on that extra money. The Council must not imagine that because the Bill passed without serious opposition it was passed without any trouble. On the contrary, the financial clauses needed very careful engineering. The parliamentary authorities were not prepared to accept them at first; and it was not without some modification—which was, happily, not serious in effect—that the clauses were passed. In addition to this, he would like to point out that at one time there was threatened opposition in the House, which had to be steered round. He need hardly say that all the skill and judgment of the Town Clerk were needed to get the Bill through. The Committee felt, and he was sure the Council felt, that thanks were due to the Town Clerk for the manner in which he engineered the Bill through. He also thought that thanks were due to the Secretary, whose marshalling of the figures did so much to remove the opposition of the parliamentary authorities in connection with the financial clauses. A 4d. rate was a very serious matter; but a rate of 1s. 1d. would have been more serious.

Mr. Walthall asked if the 4d. rate referred to by the Chairman was the maximum, and whether it would diminish afterwards, or be a continuous charge?

Mr. Murray asked whether the question of foresting the available land had been considered, and suggested that if the land were planted it might have some effect upon the vegetable growths in the pipes, of which they had heard.

Alderman Parker said he spoke of a uniform rate of 4d. for a certain number of years—not a perpetual rate. He could not tell how many years it would mean; but, roughly speaking, they might take it that in twenty years or thereabouts they would see the end of the rate, if their hopes were realized as to the future water-rental. As to Councillor Murray's question, they had arranged to have a considerable portion of the watershed, which was suitable for the purpose, planted with trees—for two reasons. First, as a means of increasing the rainfall; and, secondly, as the best way of utilizing the available land. Trees might absorb some of the moisture which caused the vegetable growth; but for the most part it was peaty moisture, and that was not suitable for the planting of trees.

The report was then put, and approved.

Electricity Committee.

Mr. Johnstone, in moving the adoption of the report of this Committee, said the general progress in the matter of electric supply was satisfactory—the quantity of current sold having increased by 1½ per cent.—and but for the debit to the revenue account of the cost of the change to a system of higher pressure, the trading for the year would have shown a very reasonable profit. The actual change-over was now nearly complete; and the whole of the system would soon be working at one common pressure. There was an increase in rates and taxes of £1300 over the previous year, which was due to the new assessment. On the other hand, there was a reduction in the charges for coal; and the Committee hoped for a still further benefit under this head. The Water Street works were now practically fitted up so as to enable them to deal with the anticipated winter supply.

Alderman Martineau asked if the Committee had considered the question of hiring motors to manufacturers. He did not think their works were fully utilized in the daytime; and it seemed to him that if the Committee considered the matter they might find it possible to do a largely increased business, while there would be a great saving to the manufacturers who hired the motors.

Mr. Walthall hardly agreed that the report was satisfactory. The progress in electric supply during the past year had not been equal to the progress of previous years. He commented upon the amount paid in altering the system, which, he said, showed that there was something wrong somewhere. Another point was the increase in management expenses, which, he thought, for a trading concern, were not satisfactory; and he protested against the price of 7d. per unit

charged to the small consumer. This charge he considered to be out of all proportion.

Alderman BEALE pointed out that progress would be made as soon as they were able to get into other districts, which they would do when the new power station was complete. All that the Water Street and Dale Street stations could do now, with the aid of the supplemental station at Edgbaston, was to do the work they already had undertaken. He agreed that the charges were high in Birmingham, but thought it would not be well to revise them until the capital charges on the extensions were disposed of. As to the hiring of motors, he was not sure whether they had the power to do this.

Mr. NETTLEFOLD said the result of this municipal trading in electric light must be disappointing to those interested in the welfare of the city. Here was a business which used to pay a handsome dividend; and as soon as it was taken over by the Corporation it became a charge upon the rates.

Alderman BEALE: It is not on the rates.

Mr. NETTLEFOLD said the result of the undertaking was not an encouragement to them to take up new work.

Mr. LOVSEY asked if the Committee had ever considered, in conjunction with the Public Works Committee, the advisability of lighting some of the principal thoroughfares of the city with electricity.

Mr. JEPHCOTT failed to see why the Chairman of the Public Works Committee should be invited to take part in any question of electric supply.

Mr. JOHNSTONE said he hoped no further reflections would be made as to the purchase of the old Company, which was a fair and honest bargain between the gentlemen who formed the Company and the Corporation. As to the hiring of motors, the question should have the consideration of the Committee. They made no call upon the rates; and they hoped in the course of a year or two to be a help to them. As to the lighting of the thoroughfares, the Gas Department did the work so well with the incandescent system that he could not advocate a change.

The report was adopted.

HULL GAS AND WATER SUPPLY.

At the Meeting of the Hull Corporation Gas and Water Committee on Monday of last week, a return was submitted by the City Treasurer (Mr. Milner) stating that the Water Department showed a credit balance on net revenue account for the year of £15,441. Of this £6000 was to be applied to the relief of the district rate, and the balance carried forward. The expenditure on capital account had been £6615, which was charged against the reserve fund. The Gas Department showed a net profit of £19, which, with the amount brought forward from previous years, made a total of £951. With respect to the gas undertaking, the Engineer (Mr. F. J. Bancroft), in a special report, said that in his estimate a year ago he calculated that, with a reduction in the price of gas to 2s. 8d. per 1000 cubic feet, a deficit of about £300 would result on the year's working. It was, therefore, with much pleasure that he drew attention to the profit of £19. The gas bought from the British Gaslight Company amounted to 99,478,000 cubic feet; and the number of consumers was 1743. In 1899, when the Corporation took the works over, the number of consumers was 1605. Having observed that the Corporation had reduced the price from 3s. to 2s. 8d., and had improved the street lighting, as well as supplied gas-cookers and fitted houses on the prepayment system, Mr. Bancroft concluded by saying that as soon as the gas undertaking was credited with the value of the old gas-works site, so as to reduce the standing charges for sinking fund and interest, the Committee would be in a position to give a further reduction of 2d. per 1000 cubic feet—bringing the price to the very favourable figure of 2s. 6d. Mr. Cooper said he thought they ought to be credited with the value of the site at once. He moved that a reduction of 2d. per 1000 cubic feet be made forthwith. Mr. Bentham seconded the resolution, but it was lost.

After some further discussion, it was decided to adopt the Engineer's report, except the paragraph referring to a further reduction.

LIGHTING AT THE TURIN EXHIBITION.

The following extracts taken from "La Stampa," with regard to the lighting of the Turin Exhibition, will doubtless be of interest, as showing the opinion held of the efficiency of the intensified gas lighting to be seen there.

When the Exhibition is open in a few days' time, our readers will be pleased with the illumination of its various departments, which illumination will assuredly form one of its most original and effective attractions. The part on the right-hand side of the principal entrance door will be illuminated by electric arc lamps, and that on the left-hand side with intensified gas-lamps. The whole of the left-hand side of the Exhibition will be illuminated with gas supplied by the Società Consumatori, who have also constructed an elegant pavilion opposite to the small lake, the "Patinoire." In this pavilion is placed the plant for compressing the gas. A great part of the lighting is on the system already in use in the Victor Emanuel Theatre. The pavilion of the Company and the paths along the lake are illuminated by 125 compressed gas-lamps (system Keith); and the entrance of the Valentino Castle, and the paths leading to the building in which are exhibited wines and oils, are illuminated by 55 compressed gas-lamps. Lastly, the path, the "Sospiri," is lit by 38 lamps. It is calculated that the public illumination, exclusive of the lamps of the private pavilions, restaurants, bandstands, &c., will be illuminated by a power equal to 400,000 candles. The electric and gas lights have converted the poetic park into an enchanting garden. What a magnificent contrast between the brilliantly lighted walks and the solitudes in shadow, remote from the reflection of the lamps. The great promenade which leads to the entrance of the Valentino deserves to be specially mentioned. It is illuminated by at least 100 large compressed gas-lamps of great illuminating power, which appear as if they would eclipse the large electric arc lamps.

MONTE VIDEO GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Thursday at Winchester House, Old Broad Street, E.C.—Mr. T. C. TATHAM in the chair.

The SECRETARY (Mr. Henry Kearns) read the notice convening the meeting and the certificate of the Auditors; and the report and accounts (which were referred to in last week's "JOURNAL," p. 1431) were taken as read.

The CHAIRMAN said he would commence by calling the attention of the shareholders to the more interesting features of the accounts under review. First, as to capital account. The total capital receipts showed a reduction from £574,500 to £568,600—a difference of £5900, which was the amount of the debentures paid off, thus reducing the debenture debt from £58,080, at which it originally stood, to £26,680. The reserve fund was consequently reduced from £48,500, at which it stood last year, to the present figure of £42,600. In the insurance fund there was no change. The contingency account was about £430 less than it was last year, which was owing to their writing off from it the difference in the value of the various investments on Dec. 31, 1901, as compared with the same date in 1900. Sundry creditors in Monte Video were about £1400 less; while loans from bankers were £3000 more. This, of course, was owing to their floating capital being reduced by the payment of debentures to the amount he had mentioned. Profit and loss (to which he would refer later on) showed an increase of £3587, as stated in the report. This, he thought, exhausted the items on the debit side of the balance-sheet. Turning to the credit side, it would be seen that the total capital expenditure was £601,089, which showed an increase of about £640. They had written off about £1200 from the various headings making up the capital account; and they had expended in new mains and additional services, &c., a sum of about £1800. The next item—stock of cannel and ordinary coal, which stood at a value of £11,087—showed an increase of about £3760 in money; and they had a considerably larger amount of coal in stock. Gas-fittings showed a decrease of about £360; and materials for use (about which he was generally asked questions), consisting of all the numerous items required by a gas company—such as mains, retorts, and fittings of all kinds—showed a reduction of over £900. Materials for sale, valued at £4117, were about the same. These consisted of ship-plates, brass and copper goods, and all kinds of material for use in the dock and the dock workshops. All these items were, he thought, quite within reasonable limits, and were not now larger than was required for the current business of the Company. Sundry debtors and outstanding accounts (£16,862) were about £320 more than in the previous year. This was another item about which he was often asked questions. It included all outstanding accounts for gas delivered, residuals sold, and fittings supplied, after deduction of bad and doubtful debts; and they would probably agree that this was not an unduly large outstanding, with reference to the amount of business done by the Company. It was the constant effort of the officers to keep these outstandings as low as possible. The next item—Government account to June, 1890, £5611—was one they had often talked about; and he was afraid that they might have after all to write down, though not entirely to write off, this amount. As he had explained before, they had kept it at the original figure, but without charging interest, because it had never been questioned by the Government. The Government had from time to time owed large sums; but they had always been satisfied in some way or another—even though long overdue. There was a proposal on foot, to which he understood that some of those interested had given their consent. It was that the holders of the debt—the Government creditors—should reduce their claims by 9 per cent., and that the balance should then be paid by an issue of bonds, not bearing interest, but with a sinking fund of 4 per cent. per annum, which was to be used in the purchase of the bonds by tender. This was said to be without prejudice to the rights of those who did not accept the scheme; but at the same time it was said that no better terms would be offered to those who did not consent until after those who did consent had been paid off. This did not seem to be a particularly equitable arrangement for a solvent debtor to make with his creditors; but at the same time it was no use disguising from themselves the relative positions in which in this case the debtor and creditor stood. The Directors had only just heard of this arrangement; and they were in correspondence with their Manager on the subject. He was therefore not at present able to say anything further about it. It had, at any rate, to go before the Chambers, where it might be either approved or disapproved. The next item—British and Colonial stock, &c.—had been valued at market price, and showed a slight reduction on the preceding year. Other property stood at about £2300 less than it did in the previous accounts; but this was owing to their having realized a certain part of it in Monte Video, and which showed a slight profit. This concluded what he had to say with regard to the credit side of the account. Turning to the revenue account, he was glad to be able to point out that the receipts were £5080 more than last year; while the expenses were about £1490 higher—showing a net increased balance on the year's trading in favour of the Company of £3591. This, under the circumstances, he ventured to hope the shareholder would consider satisfactory. He did not intend to recapitulate that which he had before said to them; but those who were old proprietors in the Company—and he saw among those present a great many faces that he recognized—would remember that they used to receive for public lighting over £20,000 a year. Now all this was ancient history; and the receipts from this source had practically all gone—the amount they at present obtained for public lighting being £265 a year. The lighting of the city was now done by means of electricity, which was a Government undertaking. When first he occupied that chair, he told the shareholders that it was the hope of the Board, and that it was their object, to increase the private consumption; but, of course, he could not say whether the increase would come quickly, or even whether it would come at all. He was glad now to be able to state that since that time the number of consumers had increased, and that it continued to increase slowly. As he had before explained, the gas consumed did not increase in the same ratio as the number of

customers, because everybody now out there burnt gas under modern methods—that was to say, they used incandescent burners, and therefore obtained a much better light with a much smaller consumption. But though this might not be a good thing in one way, it was in another, because the cheaper and better they could supply light to their consumers, the stronger and steadier would their position be. The last account was the profit and loss. After paying their dividend last year, they brought forward a balance of £1798, which compared very favourably with the year before, which, again, was an improvement on the year before that. Adding to this the revenue (£26,695) and the interest and discount, they had a total of £29,510; and deducting therefrom interest on debentures, bad and doubtful debts, the amount written off capital, and one or two other small items, they arrived at the balance of £25,963. Out of this, the Directors had decided to pay a dividend at the rate of 4 per cent. per annum, which, with the interim dividend, made 3½ per cent. for the year, and absorbed £18,697, and left a balance of £6996 to be carried forward. The Board considered this the wisest policy in the interests of the Company to pursue. A good carry forward was a great feature of strength to a company such as theirs carrying on business in a foreign country, where the conditions were not so certain as was the case in England. In the Company's more prosperous times, it was their practice to carry forward an even larger balance than on the present occasion. The shareholders would remember that last year he told them it would be desirable, for the reasons he then gave (and the proprietors agreed with him), to have an issue of debenture stock. An extraordinary meeting of the Company was held in January; and a resolution was unanimously passed authorizing the creation of £80,000 of 5 per cent. first mortgage debenture stock. They did not, of course, wish to have more of this stock issued than was absolutely necessary; and they had not up to the present been obliged to raise any of the money. They had, however, decided to do so almost at once, and to offer for subscription among the shareholders £30,280, which was the amount of bonds the Company had paid off, less the value of some the holders of which had decided to take new bonds instead of cash for their old debentures. The remainder of the issue would be reserved for exchanging for the old bonds or for selling for the purpose of buying these bonds, whichever the holders of them might prefer. He concluded by moving that the report and accounts be received and adopted.

Mr. M. T. Hood seconded the resolution, and it was carried unanimously.

On the proposition of the Chairman, seconded by Mr. Robert Morton, a dividend of 8s. per share, less income-tax, was declared.

The retiring Directors (Mr. Morton and Mr. Tatham) having been re elected,

The Chairman briefly returned thanks. He added that he had to apologize for the absence from the meeting of their friend Mr. Rostron, who had unfortunately been suffering for many weeks past from a serious illness. He had that morning received a letter from Mr. Rostron saying that he had intended to be present at the meeting, but found he was too weak to do so.

The Auditors (Messrs. Price, Waterhouse, and Co. and Mr. T. S. Soden) were afterwards re-appointed; and the proceedings closed with votes of thanks to the Chairman and Directors, the Secretary, and the officials at Monte Video.

CAPE TOWN AND DISTRICT GAS COMPANY.

The Twelfth Ordinary General Meeting of this Company was held on Saturday, at the offices, New Broad Street House, E.C.—Mr. John Boustead, J.P., in the chair.

The Secretary (Mr. H. Yuill) having read the notice convening the meeting, the report of the Directors was presented.

The Chairman, before moving the adoption of the report, read the Auditors' certificate, which set forth that all their requirements had been complied with, and that, in their opinion, the balance-sheet exhibited a "true and correct view of the state of the Company's affairs, as shown by the books." He then proceeded to congratulate the proprietors upon the fact that, notwithstanding the difficulties encountered during the year in the high price of coals and the loss of cargoes of coal in transit (which necessitated local purchases at a very high rate, and of a quality which seriously affected the carbonizing results), the Directors were able to recommend the payment of the highest dividend recorded during the existence of the Company. To show how large the expenditure had been, he mentioned that in 1900 the average net cost of coal per ton, less residuals, was only 9s. 7d., whereas in 1901 it was 25s. 5d. Calculating this difference on the 14,000 tons of coal dealt with, it was certainly a matter for congratulation that it had in no way affected the dividend. As an earnest of the future, he drew attention to the fact that during the ten years since 1891 the Company had trebled their production of gas, and that the increase had been maintained at an average rate of about 9 million cubic feet per annum. This would probably be very much added to when the works now in progress at Mowbray and Wynberg had been completed. The continued extension of the works was a most favourable feature for assuring the prosperity of the Company in the future. In conclusion, he moved—"That the report and accounts, as presented to the meeting, be received and adopted, and that the dividend recommended by the Directors for the half year ended Dec. 31, 1901—viz., at the rate of 10 per cent. per annum—be declared."

Mr. R. A. Fairclough seconded the motion; and it was carried unanimously.

The retiring Director (Mr. J. E. Lilley, who has lately visited Cape Town) and Auditors (Messrs. C. F. Kemp, Sons, and Co.) having been re-elected, votes of thanks were accorded to the Chairman and Directors, and also to the staff in Cape Town and London, and the proceedings terminated.

The Elland Gas Company are now making a special show of gas cooking-stoves, boilers, gas-fires, &c., and offering every inducement for the public to take up those specialities. For a nominal sum, residents can rent any of these articles, which are all fixed free of charge; or they can be purchased at cost price on the three years' system.

LEEDS GAS WORKERS' DISPUTE.

The Committee's Terms Rejected.

Delegates from all over the county attended a meeting of the Yorkshire Council of Gas Workers in the new Trades Hall, at Leeds, last Saturday week, for the purpose of considering the terms offered to the Leeds branch by the Gas Committee on the previous Friday (*ante*, p. 1437). On that occasion it was decided to offer an advance of 2d. per shift to the men under the present conditions; and a strong hope was expressed that this proposal would be accepted. The delegates discussed the matter at great length, and unanimously decided to reject the offer of the Gas Committee. Mr. J. E. Smith, the Secretary of the Leeds branch of the Gas Workers' and General Labourers' Union, was instructed to communicate with the Chairman (Alderman J. Lowden) to the effect that on March 24 last the terms of 4d. per shift, with certain conditions, which had been offered by the Gas Committee, had been accepted by him on behalf of the men. It was pointed out that the Committee refused to agree to the terms, which they had themselves offered two months back; and that these terms had been endorsed by the City Council and accepted by the men. The meeting unanimously agreed that the terms should be insisted upon; and it was decided to request that the advance should take place from the time of the men's acceptance of the terms—namely, March 24 last.

SALES OF STOCKS AND SHARES.

At the Mart, Tokenhouse Yard, last Tuesday, Mr. Alfred Richards sold, in accordance with instructions, stocks and shares in several important undertakings. The first lots consisted of a new issue of 3 per cent. perpetual debenture stock of the Wandsworth and Putney Gas Company; being part of the additional capital authorized by their Act of 1900. It was all disposed of at £80 per £100 of stock, which yielded the purchaser 3¾ per cent. on his investment. The next lots were a new issue of ordinary £10 shares by the Great Yarmouth Water Company, ranking for a maximum dividend of 7 per cent. per annum, but the average for the past six years having been at the rate of 4 per cent. The average price realized was £10 7s. 10d. per share, yielding £3 17s. per cent. on the investment. Another new issue, by the Romford Gas Company, followed. It consisted of 600 £5 "B" shares, ranking for a standard dividend of 7 per cent., but, under the sliding-scale, entitled to 9 per cent. per annum. They were sold at from £8 to £8 10s. each (average £8 3s. 1d.), returning the buyer £5 10s. 4d. per cent. Some £10 fully-paid new ordinary shares in the Uxbridge and Hillingdon Gas Company (last dividend 6¾ per cent.) fetched £12 10s. each, yielding £5 8s. per cent.; a few shares of a later issue, the last dividend on which was at the rate of £6 6s. per cent., realizing an average of £11 16s. 5d. each, yielding £5 7s. per cent. Among recent sales, the following may be noticed: On Monday last week, 300 new £1 shares in the Sleaford Gas Company were sold at prices ranging from £1 16s. to £1 17s. each. Some £1 shares in the Burnham Water Company were lately sold by Messrs. Buckland and Sons, of Windsor, at from £2 2s. to £2 4s. 6d. apiece; some £1 non-cumulative 4 per cent. preference shares fetched from 18s. to 20s. each. Some "D" stock of the Tunbridge Wells Gas Company, on which 8½ per cent. is being paid, was disposed of a few days ago at £174 and £175 per £100 lot, and at from £87 to £88 per £50 lot.

Reduction in Price to Large Consumers at Newcastle.—At the meeting of the Lighting Committee of the Newcastle Corporation on Tuesday last, a communication was made to the effect that the Gas Company intended to allow a further discount of 2½ per cent. to extensive consumers, including the Corporation, in addition to the existing 17½ per cent.—thus making the allowance 20 per cent.

Gas Supply Scheme for Cudworth.—A short time ago, Mr. W. W. Hutchinson, of Barnsley, was commissioned by the Cudworth Urban District Council to prepare plans and estimates for a distributing scheme for the supply of gas to the township. These were presented at a recent meeting of the Council, and unanimously adopted; and it was resolved to apply at once to the Local Government Board for power to raise the necessary money to carry out the project.

Gas Stokers' Wages at Ripon.—At a recent meeting of the Ripon Gas Committee, a petition from the gas stokers for an increase of wages was produced; and the Manager (Mr. W. T. Lancaster) submitted a return of wages in several towns about the same size as Ripon. The stokers were introduced to the Committee by the Manager, and stated their grievances; and the Committee offered to pay them the average rate of wages paid in the towns quoted for the same work, to which the men agreed. It was unanimously resolved that the wages of the stokers be fixed at 4s. 6d. per man per day of eight hours, for carbonizing not less than 2½ tons of coal, the foremen to have 2s. per week extra, as before; that no stoker be paid when the works are shut down, nor receive extra pay for Sundays; and that the practice of paying the yardmen double time on Sundays be discontinued, and time-and-a-quarter only paid.

Unsatisfactory Incandescent Gas Lighting at Newhaven.—At the last meeting of the Newhaven Urban District Council, one of the members stated that he had heard many complaints about the lighting of the town. Some of the incandescent gas-burners were absolutely useless. The lighting was very unsatisfactory; but he did not know whether it was the fault of the Council or the Gas Company. Another member said they had tried all manner of ways; and he did not think they would get a better light until they had the whole thing under their control. They were a long time before they got the cleaning into their hands; and the present unsatisfactory condition of things would be remedied if the lighting was entirely under the control of the Council. Owing to the fault of someone, the incandescent burners were often broken; and he had had serious thoughts of proposing that they should go back to the old mode of lighting.

ELECTRIC LIGHTING NOTES.

Wisdom at Gorton.

At the monthly meeting of the Gorton Urban District Council last Wednesday, Mr. E. Scully moved that the Council take steps for providing an electric light installation for the district, to work in conjunction with the destructor, a scheme for which had already been prepared. He said that the Electricity Committee had had several meetings on the subject, and had invited the other members of the Council to be present. Mr. Jennison, one of their members, had all along been opposed to Gorton using the Order; and he had been of opinion that it would be better for them to hand the Order to Manchester, and let the City Corporation deal with it. The Committee had tried to ascertain what demand there would be for electric lighting if they involved the ratepayers in a costly undertaking; and the result of their inquiries had been most encouraging. He considered that they could produce their own electricity at a less cost than they would be able to get it from other sources, as they would be working the installation in conjunction with the destructor. Mr. Howarth seconded the motion. Mr. Wainwright said he did not think they had taken into consideration the scattered area of Gorton, and that it would mean the construction of very large mains. He had gone carefully into the estimates which had been prepared; and he held that, instead of making a profit on the undertaking, it would mean a loss of about £500 a year. Mr. Jennison said that he, too, had gone carefully into the matter; and he considered that there was no real demand for the electric light, and that it would be much better for any firms who required it to lay down their own plant. Incandescent gas gave a better light, and cost considerably less to produce. After a discussion which lasted nearly three hours, the proposal was defeated by seven votes to six.

New Generating Station at Manchester.

The Lord Mayor (Alderman Hoy) last Tuesday performed the ceremony of opening the new electricity generating station erected in Stuart Street by the Manchester Corporation. The site covers 42,000 square yards; and the building is one of the largest of its kind in the country. There will be generated what is known as the three-phase current, at a pressure of 6500 volts. To reduce this pressure to one suitable for lighting, motor, and tramway purposes, 20 sub-stations are being built, in which the necessary apparatus will be housed. It was decided at first to lay down plant of 15,000-horse power at Stuart Street, and to build ten sub-stations. This scheme, however, was found to be insufficient; and in May, 1901, soon after the appointment of Mr. G. F. Metzger, the present Electrical Engineer, specifications were issued for two new 6000 horse power engines, and plant for ten more sub-stations. It is considered probable that in the near future two further sets of these great engines will be required, and that the full load of the station will ultimately be not less than 70,000-horse power. In order to facilitate the carrying of coal to the works, a special railway siding has been erected. One hundred trucks of coal per day will be required to supply 70,000-horse power; and a million gallons of water will be needed for the boilers and the condensing apparatus. The canal will be used to some extent for water for condensing purposes; but it has been found necessary to erect cooling towers in addition. The water is used over and over again, after having been cooled by fans; and it will only be necessary to take from the city mains sufficient to make good the losses due to vapour. A huge subway has been built in order to carry the cables, distributors, potential wires, and telephone wires from the works as far as the Ashton New Road. The tunnel passes under the canal, and is 940 feet in length. The provision of this subway will render unnecessary any further opening of the ground for the purpose of cable laying; and yet another advantage is that the cables will all be under supervision. Current will be supplied from the sub-stations at a pressure of 200 and 400 volts for lighting and motor purposes, and at 500 volts for the tramways.

Electric Lighting of St. Paul's.

Reference has already been made to the installation of electric lighting which is being carried out in St. Paul's Cathedral—a portion of the scheme having been brought into use at Easter. The work has been in progress for more than three years; and at Whitsuntide it had advanced sufficiently to permit of the employment of the light throughout the chancel, dome, nave, and crypt. This is about two-thirds of the entire scheme; the portion remaining including the choir aisles, entrances, consistory court, whispering gallery, and some other parts of the building, which will take about 18 months to finish. In the choir there are six large pendants of cast and gilded brass, which hang from the vault and carry the lamps that light the floor. In addition, on their upper parts these have a ring of lamps, sunk out of sight in golden cups, which cast their light upwards to the mosaics of the roof. When these lamps alone are alight, without those on the lower part of the pendants, the mosaic work is suffused with a rich golden glow, which will be strengthened, when the installation is complete, by a row of hidden lamps placed along the cornice. In addition to the pendants in the choir, there are four gilt bracket lights upon the chancel screens, and a 10-light fitting in the apse. The choir desks are fitted with standards containing concealed lights, which do not add to the general illumination. Under the dome there are eight heavy bronze pendants, which, together with two others in the transepts, give ample light for reading. Down the nave the familiar tall standards, as well as the two at the west entrance, remain as they were, so far as their bases and pillars are concerned; only the heads, carrying electric lamps in basin-shaped glasses, being designed afresh. The crypt is lighted by the old gas-fittings in the shape of hanging Roman lamps, which have been adapted to the electric light. Some 16 miles of cables have been used in the installa ion, and the lamps are fixed alternately on different circuits throughout, connected to two separate supplies of current, so as to minimize the risk of breakdown. The fittings were designed by Mr. Somers Clarke, the Consulting Architect to the Cathedral authorities, and the installation has been carried out under his supervision, in association with Dr. A. B. W. Kennedy. Already nearly the whole of the £10,000 given by Mr. Pierpont Morgan has been spent.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1479.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 11	10½	Alliance & Dublin 10 p.c.	18—19	..	5 10 6
100,000	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
300,000	100	Jan. 2	5	Australian 5 p.c. Deb. .	100—102	..	4 18 0
200,000	5	May 14	6¼	Bombay, Ltd. . . .	6—6¼	..	5 0 0
40,000	5	,,	6½	Do. New, £4 paid	4¾—4¾	..	5 9 5
380,000	Stk.	Feb. 13	12	Brentford Consolidated	255—260	..	4 12 4
270,000	,,	,,	9	Do. New . . .	188—193	..	4 13 3
50,000	,,	,,	5	Do. 5 p.c. Pref. .	128—133	..	3 15 2
206,250	,,	Dec. 13	4	Do. 4 p.c. Deb. .	112—115	..	3 9 7
220,000	Stk.	Mar. 13	10	Brighton & Hove Orig.	205—210	..	4 15 3
246,320	,,	,,	7	Do. A. Ord. Stk. .	148—153	..	4 11 6
420,000	20	Apl. 11	10	British.	40½—41½	..	4 16 5
50,000	10	Feb. 13	12	Bromley, Ord. 10 p.c. .	23—25	..	4 16 0
82,850	10	,,	9	Do. 7 p.c. . . .	18—20	..	4 10 0
500,000	10	May 14	6	Buenos Ayres (New) Ltd.	9¾—10¼	..	5 14 3
220,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	94—97	..	4 2 6
150,000	20	Mar. 13	8½	Cagliari, Ltd. . . .	21—23	..	7 3 6
100,000	10	Sept 27	10	Cape Town & Dis., Ltd.	15—16	..	6 5 0
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	54—56	..	5 7 2
550,000	Stk.	Apl. 11	12	Commercial Old Stock	264—269	−3	4 9 3
236,425	,,	,,	9	Do. New do. .	205—210	..	4 5 9
238,237	,,	Dec. 13	4½	Do. 4½ p.c. Deb.	130—135	..	3 6 8
800,000	Stk.	May 28	8	Continental Union, Ltd.	135—140*	−1	5 14 4
200,000	,,	,,	7	Do. 7 p.c. Pref.	150—155*	−1½	4 10 4
575,000	Stk.	Feb. 27	5	Crystal Palace Ord. 5 p.c.	120—125	..	4 0 0
60,000	,,	,,	5	Do. 5 p.c. Pref.	122—127	..	3 18 9
486,090	10	Jan. 30	10½	European, Ltd. . . .	18½—19½	..	5 7 8
354,060	10	,,	10½	Do. £7 10s. paid	13½—14½	..	5 8 8
15,243,200	Stk.	Feb. 13	4⅞	Gas-light and Coke — 4 p.c. Ord. . .	93—93	..	4 12 7
2,600,000	,,	,,	3½	Gas-light and Coke — 3½ p.c. max.	88—90	..	3 17 9
3,799,735	,,	,,	4	Gas-light and Coke — 4 p.c. Con. Pref.	107—110	..	3 12 9
4,193,975	,,	Dec. 13	3	Gas-light and Coke — 3 p.c. Con. Deb.	91—93	+1	3 4 6
70,000	10	Nov. 13	8	Hongkong & China, Ltd.	13—14	..	4 16 2
3,800,000	Stk.	May 14	10	Imperial Continental .	203—208	..	4 16 2
473,600	Stk.	Feb. 13	3½	Do. 3½ p.c. Deb. Red.	100—102	..	3 8 8
561,000	Stk.	Feb. 27	10	Liverpool United A .	215—217	..	4 12 2
718,100	,,	,,	7	Do. do. B .	166—168	..	4 3 4
306,083	,,	Dec. 30	4	Do. do. Deb. Stk.	118—120	..	3 6 8
75,000	5	Dec. 13	4	Malta & Medn., Ltd. .	4¾—5	..	4 0 0
560,000	100	Apl. 1	5	Met. of 5 p.c. Deb.	106—110	..	4 10 11
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	103—105	..	4 5 9
541,920	20	Nov. 13	3½	Monte Video, Ltd. . .	9¾—10¼	..	6 13 4
1,595,832	Stk.	Feb. 21	4⅜	Newc'tle & G'tesh'd Con.	106—107	..	4 1 9
346,855	Stk.	Dec. 27	3½	Do. 3½ p.c. Deb.	100—102	+2	3 8 8
150,000	5	May 28	8	Oriental, Ltd. . . .	7—7⅛*	..	5 6 8
135,000	4½	,,	8	Do.	6—6½*	..	5 10 9
15,000	1	,,	8	Do.	1¾—1¾*	..	4 11 5
60,000	5	Mar. 13	7	Ottoman, Ltd. . . .	6¼—6½	..	5 3 8

* Ex. div.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
851,070	10	Apl. 25	7	River Plate Ord. . .	10—10¼	..	6 13 4
250,000	Stk.	Dec 30	4	Do. 4 p.c. Deb..	95—98	..	4 1 8
250,000	10	Mar. 26	8	San Paulo, Ltd.. . .	11½—12½	..	6 8 0
135,000	Stk.	Mar. 13	10	Sheffield A	239—241	..	4 3 0
209,984	,,	,,	10	Do. B	238—240	..	4 3 4
523,498	,,	,,	10	Do. C	237—239	..	4 3 8
5,850,000	Stk.	Feb. 13	5	South Met., 4 p.c. Ord.	119—121	..	4 2 8
1,627,965	,,	Jan. 16	3	Do. 3 p.c. Deb. . .	92—94	..	3 3 10
380,940	Stk.	May 14	5	Southampton Ord. . .	102—106	..	4 14 4
70,825	,,	Jan. 16	4	Do. 4 p.c. Deb.	100—102	..	3 17 8
120,000	Stk.	Feb. 27	5½	Tottenham and Edmonton — A. 5 p.c.	120—125	..	4 8 0
260,520	,,	,,	4	Tottenham and Edmonton — B. 3½ p.c.	95—100	..	4 0 0
182,380	10	Jan. 16	5	Tuscan, Ltd.. . . .	7—8	..	6 5 0
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	97—100	..	5 0 0
230,000	5	Mar. 13	9	West Ham, 10 p.c. . .	9—10	..	4 10 0
172,000	10	,,	6	Do. 7 p.c. .	13—14	..	4 5 8
140,900	Stk.	Dec. 30	4	Do. 4 p.c. Deb	105—110	..	3 12 9
				WATER COMPANIES.			
780,599	Stk.	Dec. 30	11½	Chelsea, Ord. . .	305—315	..	3 13 0
150,000	,,	,,	5	Do. 5 p.c. Pret. .	155—160	..	3 2 6
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	140—145	..	3 2 1
175,785	,,	Mar. 26	4½	Do. 4½ p.c. Deb. .	140—145	..	3 2 1
1,720,560	Stk.	Mar. 26	8	East London, Ord.. .	208—213	..	3 15 1
654,740	,,	Dec. 13	4½	Do. 4½ p.c. Deb. .	143—148	..	3 0 10
1,018,046	,,	,,	3	Do. 3 p.c. Deb. .	96—98	..	3 1 3
700,000	50	Dec. 13	8	Grand Junction — 10 p.c. max..	113—118	..	3 7 10
310,000	Stk.	Mar. 26	4	Grand Junction — 4 p.c. Deb..	127—130	..	3 1 7
708,000	Stk.	Feb. 13	16	Kent	295—305	..	5 4 11
160,000	,,	,,	7	Do. New, 7 p.c. max..	200—210	..	3 6 8
1,043,800	100	Dec. 30	10½	Lambeth, 10 p.c. max..	295—300	..	3 10 0
406,200	100	,,	8	Do. 7½ p.c. max..	210—220	..	3 12 9
350,000	Stk.	Mar. 26	4	Do. 4 p.c. Deb..	125—130	..	3 1 7
500,000	100	Feb. 13	12⅝	New River, New Shares	405—415	..	3 1 8
1,000,000	Stk.	Jan. 30	4	Do. 4 p.c. Deb..	127—132	..	3 0 7
902,300	Stk.	Dec. 13	7	South-wark and Vauxhall — Ord. . .	193—198	..	3 10 8
126,500	100	,,	7	South-wark and Vauxhall — 7½ p.c. max.	185—190	..	3 13 8
489,200	Stk.	,,	5	South-wark and Vauxhall — 5 p.c. Pref. .	153—158	..	3 3 3
1,019,585	,,	Apl. 11	4	Vauxhall 4 p.c. A Deb.	125—130	..	3 1 7
1,155,066	Stk.	Dec. 13	10	West Middlesex. . .	285—295	..	3 7 9
200,000	,,	,,	4½	Do. 4½ p.c. Deb. .	140—145	..	3 2 1
200,000	,,	Mar. 13	3	Do. 3 p.c. Deb. .	95—97	..	3 1 10

* Ex. div.

LAMBETH WATER-WORKS COMPANY.

The Half-Yearly General Meeting of this Company was held at the Offices, Brixton Hill, last Tuesday—Viscount HAMPDEN, G.C.M.G., in the chair.

The report of the Directors for the six months ending March 31, noticed in the "JOURNAL" last week (p. 1440), having been presented,

The CHAIRMAN, in moving its adoption, referred in feeling terms to the loss the Company had sustained by the death of his predecessor in the Chair (Mr. H. G. H. Norman), and proceeded to deal with the Bill now under consideration by the Joint Committee of the two Houses of Parliament. He said: When matters had progressed so far that the Government had carried the second reading in the House of Commons of a Bill for the compulsory purchase of the property and rights of the Metropolitan Water Companies, it became obvious that the question, as between regulation and purchase, had been finally decided in favour of the latter; and that the Companies had no choice but to acquiesce in the decision—devoting their whole energies to secure for their shareholders just and equitable compensation. Not that we admit, or ever can admit, that this transfer will be for the advantage of the water consumer or the London ratepayer. On the contrary, we know that these will suffer disadvantage by the substitution of a fluctuating for a permanent managing body. But we bow to the inevitable. We sell, but we do so as unwilling vendors. While the Government have professed a desire to deal equitably with the Companies, their conduct of the Bill has forced upon the Companies the view that they are far more concerned in carrying their Bill as originally framed than to do justice to those whose interests it particularly affected. Although the promoters of the Bill, they insisted upon placing a member of their own body in the chair of the Committee charged with the duty of settling the provisions of the Bill. What would have been said if, in the case of a Railway Bill, the Chairman of the Committee had been a member of the promoting syndicate? I desired to draw attention to the action of the Government in this matter in the House of Lords; but I was dissuaded from doing so by other Directors of the Water Companies who had more confidence in Lord Balfour in such a position than I had. I know Lord Balfour well, and have a great regard for him. Were he in an independent position, I should also have confidence in his judgment and equity. But he is in an impossible position as Chairman of this Committee. He is, in fact, the nominee and representative of the Government, and is as much the Counsel for the Local Government Board as is the able barrister who represents the Board in the Committee-room. But the Government have shown in an unmistakable way that they dominate the Committee through their own Chairman; for they have not shrunk from coercing the Committee to go back on its own wise decision (in my opinion) to establish a more efficient and workable Board. The constitution of the Board does not affect our interests, except that we shall have to negotiate with it; but we are concerned, in the public interests, to see that provision is made for an effective administration of the future water supply of London. We more than suspect that Mr. Long's Board will prove to be unwieldy, over-large, and quite inexperienced; and for my own part (without pledging other members of the Board) I have no hesitation in expressing the opinion that, if the Companies are to be destroyed, the London County Council is the only authority whose position and experience entitle it to have charge of the water supply in the London area—provision being made for the representation of the outside area and any other interests that may be affected. It is a pity, I think, that political considerations should have influenced the Government to propose an authority so grotesque as that which they seem determined to establish. Perhaps, however, the most extraordinary proposal in the Bill is the one to take our property before paying for it. The "appointed day" is a chicken which will come home to roost. Mr. Long will probably live to see this principle bettered by his successor. There will be plenty of threatened interests in the future—railway companies, for example, dock companies, City Guilds, who will all have their "appointed day." The Government pressed this plan, having, it is said, a fear that the Companies will delay arbitration. That is an absurd fear, for our interests lie in the other direction. On the contrary, it may, and probably will, be the interest of the new Water Board to delay the arbitration so as to take possession before payment is made; and we are pressing Parliament to protect us against this possibility. Surely the Government will, even at the last moment, see the justice of our demand in this particular. I am not sanguine, for we have experienced difficulty in obtaining even the most reasonable amendments for securing our just rights. If the Government should persist in refusing us any protection against delay by the Water Board, we shall have to organize resistance to the Bill in wider interests than those now immediately threatened. The Bill also creates the precedent, which the Committee have approved, of redeeming, without compensation or agreement, perpetual debenture stock which has been created and purchased on the faith of parliamentary authority. Another awkward precedent has been set by referring the Bill to a Joint Committee of the two Houses of Parliament; thus depriving threatened interests of their usual protection of the review by a Committee of the Second House of the decisions arrived at by the first. At the present time, we have obtained a few concessions—or rather, to speak more correctly, improvements on the original proposals, the chief of which are: (1) Postponement of the appointed day to a more distant date, which has not yet been fixed.* What we want is not necessarily a distant date, but the certainty that matters shall be settled and complete payment and transfer made on or before the appointed day. (2) That the stock to be isssued to the holders of perpetual debenture stock shall not be redeemed until after the expiration of a period of sixty years. The Companies asked that the irredeemable stock should not be redeemed against the wishes of the holder; and failing to obtain this, they asked that the time for redemption should be eighty years.

* It will be seen by our report of the proceedings before the Committee that this has now been done.—ED. J.G.L.

PEACE AT LAST.

Hire out the

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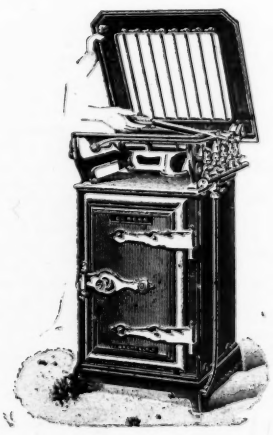
and ensure peace

of mind to yourself.



(3) Payment to the Companies of compensation in cash, except the Company and the Board agree that payment shall be made in stock. (4) The amount of compensation is to be arrived at on the principles of the Lands Clauses Consolidation Acts instead of being fixed at the absolute discretion of the Arbitrators or a majority of them. These concessions remove some of the objections entertained to the Bill; but there are several objectionable features remaining which we shall endeavour to have deleted or modified. With regard to the new business of the Company, 3995 new supplies were added during the twelve months to Lady-day last—that is to say, adopting the multiple of the Official Water Examiner, the Company have had to provide for the wants of an additional population in a single year of no less than 24,848 persons. This represented the new business of one Company in one year, and the magnitude of the operations of the London Water Companies is perhaps of special interest at the present moment, when a determined effort is being made to transfer the supply of water in the Metropolitan area from the hands of public companies to a public authority. Looking back for a period of ten years, the Lambeth Company alone have had to provide an additional supply of water for no less than 185,244 persons; and the ease with which this large population has been provided for would be remarkable if the people of London were not accustomed to it. The population now supplied by the Lambeth Company is nearly 800,000, or not far short of the total population of the whole of London a century ago. The water is, to quote from the report of the Royal Commission of 1893, "of a very high standard of excellence and of purity," and, on an average, 35 gallons are supplied to every man, woman, and child in the Company's area every day throughout the year, including Sundays. The average income for each new supply is less than £2 7s. 9d. a year, or, taking 6·22 persons per supply, less than 2d. per week per head. The Company may therefore fairly apply to themselves the words of the Royal Commission of 1899, and claim that they "have, upon the whole, performed their duties to the public satisfactorily and well."

The report was adopted, and the dividends recommended therein were declared.

WEST MIDDLESEX WATER-WORKS COMPANY.

The Half-Yearly General Meeting of this Company was held last Tuesday, at the Office, Marylebone Road—Mr. E. Boulnois, M.P., in the chair.

The Secretary (Mr. F. H. Wybroo) read the notice calling the meeting, and subsequently the report of the Auditors, in which it was stated that the expenditure on capital account had been £1,954,536, including £22,680 spent in the past half year, making £16,013 in excess of the amount received. The revenue for the six months ended Lady-day last amounted to £151,835; showing an increase of £6326 on that of the corresponding period of the previous year. The water-rental received was £138,203; and the balance to the credit of the dividend and interest account was £52,075.

The Chairman stated that, as regarded the new works referred to in the last report, the new engine at Hammersmith had been satisfactorily set to work, and the new coal-store finished and put into use. The 24-inch main from Harlesden to the Shoot-up Hill reservoir had been brought into use; and the 30-inch main, which was now being laid from the Brompton Road to Campden Hill for intercommunication purposes, would be completed very shortly. In connection with this matter, he desired to say that during this year the whole of the intercommunication scheme which was laid before the Local Government Board would be in operation, and that this summer, at all events, there would be no chance of a deficiency of supply in any part of the Metropolitan district. The Engineer (Mr. M. W. Hervey, M.Inst.C.E.) reported that all the Company's works had been maintained in a thoroughly efficient condition. The number of new supplies laid on during the half year was 686, making a total of 88,422, all of which received the constant supply. Perhaps the most interesting feature in the report was that which dealt with the Bill that had been introduced by the Government to establish a Water Board to acquire the undertakings of the Metropolitan Water Companies. The Bill was read a second time after a discussion in the House of Commons, and was referred to a Joint Committee of the Lords and Commons, who were resuming their labours that day, after the holidays. It would be unbecoming of him to criticize the decisions and opinions given by the Committee up to the present time; but he might be permitted to say that he confidently hoped that the Companies would be able to induce them to modify or amend some of the remaining objectionable features in the measure. The Committee had already extended the time at which all the Companies' undertakings were to have been handed over to the new Water Board from Jan. 1 next—the day named in the Bill—to Jan. 1, 1904; but the Companies still strongly objected to so short a limit of time even as the later date. If it was feared that the Companies might obstruct and cause delay—which he did not for a moment believe would be policy on their part—he thought that a specified time might be named from the date when the new Water Board gave notice to them to treat. In his judgment, this would be fair to both parties, and would accelerate the arbitration when once it was begun. From a long and practical knowledge of public Boards, he should be inclined to believe that if any delay occurred it would be on the part of the new Water Board; and he thought that the Companies ought to be secured from a procrastination which might prove very inconvenient to them, and might be most inimical to their interests. In any case, they strongly objected to their property being handed over to their successors before even the value was ascertained, except under the long-established and well-recognized conditions of arbitration; and those of the proprietors who knew the work of arbitration in these matters would well appreciate what he meant. He did not, however, think it was worth while for him to dwell on this question, as it was practically *sub judice*, and he most sincerely hoped that justice might be done to the Companies, either by the Joint Committee or by

Telegraphic: "Fortress, Donnington, Salop."

C. & W. WALKER, Ltd.

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MIDLAND IRON-WORKS, DONNINGTON, NEAR NEWPORT, SHROPSHIRE.

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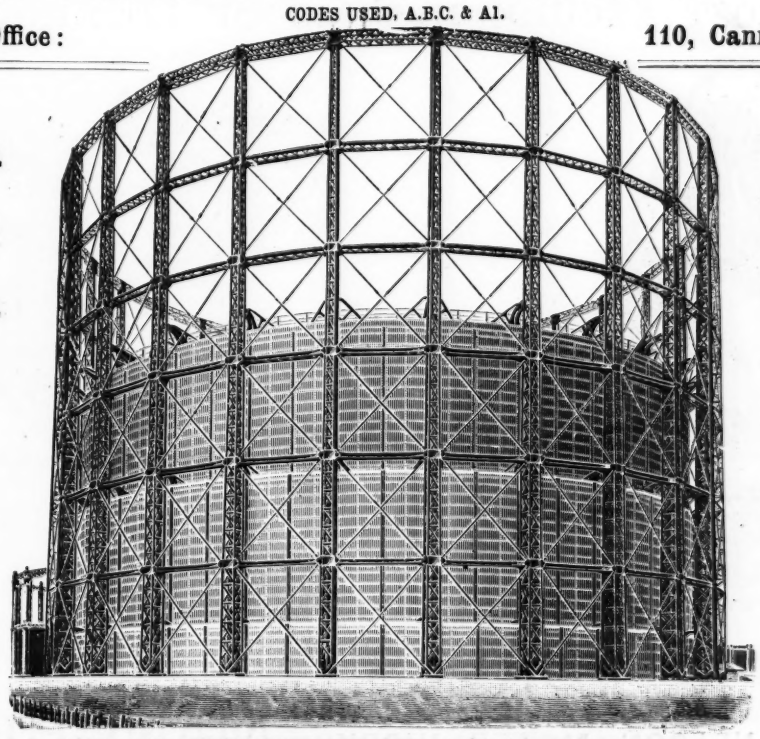
CONDENSERS.
TAR PLANTS.
SULPHATE OF AMMONIA PLANTS.



WASHERS.
WASHER-SCRUBBERS.
CLAUS' SULPHUR RECOVERY PLANT.
CENTRE AND FOUR-WAY VALVES.
MILBOURNE'S PATENT GRID-VALVES.
HYDRAULIC MAIN VALVES.
RETORT-MOUTHPIECES.
SLIDE-VALVES, TAR-BURNERS, SIEVES.

GASHOLDERS.

the Legislature. He might state that after the deliberations of the Committee had been completed and they had given their decision, the Bill must come down to the House of Commons, and be treated like all Public Bills, and go through a Committee of the whole House. As the proprietors could well understand, the Directors were passing through a very anxious time; but they were doing, and would continue to do, their best to defend the Company's property, and to look closely after the interests of the many stockholders who had placed their savings in the undertaking, which had been trading all these years under the direct sanction and protection of Parliament. With respect to the paragraph in the report dealing with the question of the reduction from 10 to 5 per cent. of the rebate which had been allowed for a good many years to all the Company's customers, this step had been taken in consequence of the great increase in the rates and charges, in the cost of labour and materials, and also in consequence of the heavy annual payments which had to be made to the City Chamberlain. The Directors had delayed the reduction of the rebate as long as they possibly could, and perhaps they had waited a little too long, because they were now obliged to dip into the reserve fund to the extent of £6000 in order to pay the statutory dividend. It was, however, only a temporary withdrawal; and the Board hoped—in fact, they confidently anticipated—that they would be able very shortly to replace to the reserve fund the small amount which it was now proposed to take from it. It was also well to bear in mind that the Company had still at their back the valuable reserve mentioned—the rebate of 5 per cent. which was still allowed to the consumers. The rates and taxes increased year by year, and he feared that they would continue to do so. In the six months ended the 31st of March, the Company paid in rates and taxes, exclusive of income-tax, upwards of £17,000—making nearly £35,000 in the course of the year; and he very much feared that the drain upon the unfortunate ratepayers' pockets was not likely to be reduced. He also thought it probable that the Company's law and parliamentary charges would be very heavy in connection with the inquiry which was now going on. In addition, there was the expenditure on the new reservoirs and works at Staines. This was a very heavy charge on the Company, because no profit was at present derived from these reservoirs. By-and-bye they would, no doubt, prove a great and valuable addition to the supply of water to the Metropolis; but, meanwhile, the charges in connection with them were very heavy, and must necessarily increase. Up to the present the Company had contributed—he was not referring to the outlay on capital account—about £30,000 towards the expenses of the Staines Reservoirs Joint Committee, the whole of which, of course, had come out of revenue. They had also to meet that most unfair burden, the charge made annually under the Act of Parliament for the City Chamberlain. This now amounted to a considerable sum out of their revenue, and it must necessarily increase, as the proprietors were aware. He called it an "unfair burden" because he was certain that there was no other class of industrial company in the country that had to bear such a tax, which, it must be remembered, was imposed at a special time, and under peculiar conditions. He thought it was a tax which ought to be removed if the Companies continued to exist. However, with all these drawbacks and obligations, he was justified in reminding the proprietors that the Company had a magnificent property. There was a very large outlying district still undeveloped, but which must be built upon in course of time; and from this they would derive considerable revenue, while their central district was improving year by year. He could only say that if they were left alone they would continue to give a pure and unstinted supply of water at a cheap rate, and at a handsome profit to themselves. He concluded by moving the adoption of the report and accounts.

The Deputy-Chairman (Mr. Jackson Hunt) seconded the motion.

The Chairman, in answer to a question, stated that it had not been finally determined how the property of the Companies would be paid for in the event of the Bill passing. The latest decision of the Committee was that the payment would be made either in cash or stock, he took it, at the option of the stockholders.

The motion was then put and carried unanimously, as was a resolution authorizing the Directors, in accordance with the provisions of section 8 of the Company's Act of 1852, to transfer a sum not exceeding £6000 from the reserve fund to the dividend and interest account, and to replace the amount so transferred out of future surplus income from time to time available for the purpose. Resolutions were also subsequently passed declaring a dividend on the consolidated stock for the past half year at the rate of 10 per cent. per annum, less income-tax, and re-electing the retiring Directors and Auditors.

A vote of thanks to the Chairman and Directors, "for their diligent attention to the business of the Company and for their able and satisfactory management of its affairs," was afterwards accorded.

The Chairman, in reply, remarked that he should not say "good-bye" to the proprietors that day; many things might happen. He would not prophesy one way or the other; but he should not believe that he was expropriated until the door was absolutely shut in his face.

Increase in Price at Blackburn.—Following on the 1s. increase in the rates, the Gas Committee of the Blackburn Corporation have decided to raise the price of gas 3d. per 1000 cubic feet. The increase is due to a loss of about £7000 on the past year, caused chiefly by the rise in the price of coal, for which the Corporation have paid £14,000 more than in the previous year, and to a decrease in the amount received from the sale of coke—the receipts under this head being about £4000 less.

Gas Workers in Yorkshire.—The occupational results of the Census of March last year in respect of the administrative County of York are now available. They show that 6448 persons were enumerated as employed in gas-works service. Of this total 5 are described as "employers," 6433 as "working for employers," and the remaining 10 persons as "others or no statement." Grouped under age headings, the totals are as follows:—10, 3; 14, 5; 15, 146; 20, 580; 25, 1689; 35, 1810; 45, 1325; 55, 671; 65, 203; 75 and upwards, 16

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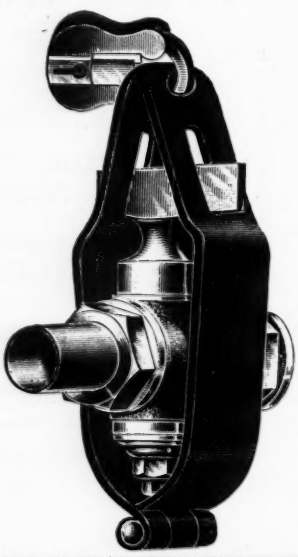
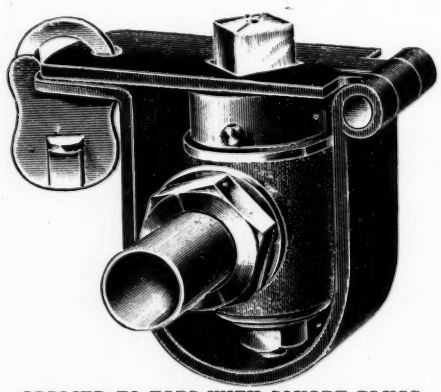
"THE MOST SECURE METHOD OF LOCKING TAPS."



APPLIED TO TAPS WITH THUMB PLUGS.



APPLIED TO TAPS WITH SQUARE PLUGS.

Prices and Particulars on application to—

SAWER & PURVES,

NELSON METER WORKS, MANCHESTER.

STAFFORDSHIRE POTTERIES WATER-WORKS COMPANY.

The Annual Meeting of this Company was held at Hanley last Wednesday, under the presidency of Mr. JAMES MADDOCK.

The report submitted stated that the water-revenue for the year was £51,090, against £49,195 for 1901, showing an increase of £1894. The profit on revenue account was £24,224, which, with the balance brought forward on last account (£1017) made a total of £25,241. After providing for the interim dividend paid in December last, there remained a balance of £12,903, which the Directors recommended should be appropriated as follows: To the payment of a dividend at the rate of 8½ per cent. per annum on the consolidated ordinary stock (free of income-tax), making, with the interim dividend, 8½ per cent. for the year, £10,412; to the payment of a dividend at the rate of 7 per cent. per annum on the consolidated new ordinary stock (less income-tax), making, with the interim dividend, 7 per cent. for the year, £1925; to be carried forward, £566. The demands for water during certain periods of the past year had been unusually heavy; but no difficulty had been experienced in affording a full supply.

The CHAIRMAN said the report rendered a plain and unvarnished account of the Company's proceedings during the last twelve months. It did not present any particularly new features, as they had nothing very fresh to bring before the notice of the shareholders. He thought, however, that they were entitled to congratulate themselves upon the result of the working for the past year. Of course, the natural growth of the district entailed an expenditure from time to time; and water companies had to look ahead, and provide for coming wants. What they proposed to do was to obtain power to raise additional capital as required. It might be that the balance carried forward was not so large as before; but this had been effected to some extent by the increased costs they had had to meet. Taking the increased cost of fuel, it was something like an addition over normal prices of £1200. Still, he thought they could not altogether complain of the additional cost of things. He concluded by moving the adoption of the report and accounts.

Mr. R. E. NARRAMORE seconded the motion, which was carried.

Dividends were next declared on £55,000 of new ordinary stock and £215,000 of ordinary stock.

At an extraordinary meeting held subsequently,

The CHAIRMAN moved that the Directors be authorized to raise £21,000 by the issue of consolidated new ordinary stock, and £7000 by the issue of perpetual 3½ per cent. debenture stock at such times as they thought fit, as authorized by the Staffordshire Potteries Water-Works Act, 1888. In doing so, he said they only proposed to raise the money from time to time, as it might be required. At present, they proposed to raise a portion for the cost of an additional main which they were putting through from Newcastle to Tunstall, a district that was considerably increasing in population all along the line.

Mr. NARRAMORE seconded, and the proposal was carried.

WATER SCHEME FOR THE TORPOINT DISTRICT.

Mr. G. R. Strachan has presented to the St. Germans District Council a report on a scheme of water supply for Trevol, on the Cornish bank of the Tamar, where the Admiralty are about to erect a large gunnery establishment. His attention was first directed to the Liskeard source of supply; but he came to the conclusion that, though sufficient water might be obtained, it would be dear, and that, under all the circumstances, it would be better to have an independent supply. He, therefore, recommends the Council to go to Hawkstor Downs, and take the water of the Withey Brook—a stream which has an average flow of 6 million gallons a day, with a minimum yield of 2 million gallons. The gathering-ground has an area of six square miles, mostly unenclosed; and its elevation (700 feet above Ordnance datum) commands the whole of the district comprised within the St. Germans area. The distance from Torpoint is 24 miles; and Mr. Strachan shows that, by making suitable branches, the pipe-line could easily serve a wide area, including Saltash, which is now served from Plymouth, and a number of small towns and villages dependent upon local supplies. It could also be extended to serve the forts overlooking the Channel to the west of Plymouth Sound. If the scheme is confined solely to Trevol and the Admiralty requirements, the cost for 120,000 gallons per day will be £21,500, or (at 3½ per cent., with 50 years for repayment) an annual charge of £1440. If the main is made large enough to deliver 200,000 gallons, the cost will be £26,000; while the more comprehensive scheme, including the main to Saltash, and a total of 300,000 gallons a day, will cost £34,500, or £2400 a year. Proportionately, the latter is, of course, the cheaper scheme. The Council will submit the scheme to the Admiralty, who guarantee a minimum income of £500 a year, and will also consult the War Office and the neighbouring Local Authorities as to their possible requirements.

WATER SUPPLY IN PARIS AND BERLIN.

A recent number of the "Revue Industrielle" contained some statistics relating to the water supply of Paris and Berlin. Unfortunately, they are not so recent as might be wished, but they enable a comparison to be made between the cities, and so may be of interest.

Taking Paris first, the volume of water supplied to the city in the year 1900 was 236,479,800 cubic metres (1 cubic metre = 220 gallons). The daily average was 647,890 cubic metres, in which total spring water figured for 226,640 cubic metres and river water for 401,610 cubic metres. The water was delivered at an average rate of 7·5 cubic metres, and occasionally of 10 cubic metres, per second. The accounts of the Compagnie Générale des Eaux, who are really the purveyors of water in the city—taking it from the mains, into which it is brought by the Municipality, and supplying the consumers—show that the sums

ces, ses ell- by he ro- ck Sir ne d- ng

chiefly by thousands of sightseers.

A COOL BURGLAR.

St. John's Vicarage, Newbury, the residence of the Rev. Wickham Legg, has been entered by a thief, and several pounds in silver and copper stolen. The burglar, after his labours, utilized a gas-stove* in the kitchen to cook some food, and further regaled himself with wine and tobacco before decamping.

"THE GLOBE,"
May 16/02.

Roy. Pr Duk nigh Th terd Ti Wie Th Prin ever

Richmond's
Gas
Cookers
Used by
Royalty
Nobility
Gentry
and
Burglars!

* Richmond's Cookers are hired out by Newbury Gas Department.

paid as water-rates in the above-named year amounted to 14,695,307 frs. for spring water, 2,736,782 frs. for river water, and 1,235,176 frs. for water from the Ourcq. Reckoning 35c. per cubic metre for the total volume of spring water, the bulk should be 41,986,592 cubic metres. This, however, is not strictly correct, because the public establishments are not included. It appears from the figures that the private consumers of Paris are not responsible for at least 30 per cent. of the spring water and 50 per cent. of the total quantity. The average consumption per head is 249 litres (about 54 gallons) per day—viz., 86 litres of spring water and 163 litres of river water. Making ample allowance for leakage, street watering and sewer flushing appears to account for about 100 million cubic metres of water got rid of after leaving the reservoirs. It will no doubt appear to many that 249 litres is too much for a city where people only consume 45 litres of spring water and 54 litres of river water—together, 99 litres—for their personal requirements.

Ten years ago the water supplied to the Paris suburbs was almost exclusively taken from the Seine and Marne, and was consumed without previous filtration. The pumping works were constructed above and below the city. After the cholera epidemic of 1892, the Prefect of the Seine invited the Compagnie Générale des Eaux to consider the steps to be taken to improve the quality of the water; and in 1894 arrangements were made to carry out the necessary changes. The result was that the works have all been removed to a point above the city, where the water is much purer than it is below. They are three in number, and can supply from Choisy-le-Roi, on the Seine, 80,000 cubic metres, and from the Neuilly and Nogent works, on the Marne, 50,000 and 12,000 cubic metres respectively. After filtration, the water is pumped into two large reservoirs in the north-east and south at Hautes Bruyère, near Villejuif, for the Choisy-le-Roi works, and at Montreuil for those on the Marne. On the west and north there are two reservoirs, at Puteaux and Pierrefithe, which receive the overflow from the mains, and act as auxiliaries; and there are also smaller ones. The system of purification adopted is the well-known iron one of Anderson, which is employed at Antwerp and elsewhere. The results obtained are perfectly satisfactory; the quantity of organic matter in solution being reduced to an average of 40 to 60 per cent. The number of bacteria does not exceed 400 per cubic centimetre in the filtered water, while in the raw water supplied it averaged in the year 1900 37,900.

At the close of 1900, the population of Berlin was 1,855,901, according to the official figures; but the number of persons supplied with water was probably 1,880,000. The total volume of water distributed in the year ending March 31, 1901, was 55,216,903 cubic metres—53,859,427 cubic metres being consumed in the city, and 1,357,476 cubic metres in the suburbs. The total was divided as follows:—

Private consumers . . .	45,677,107 cubic metres, or	82·72 per cent.	
Municipal service . . .	4,899,148	,, ,,	8·87 ,, ,,
Loss by leakage . . .	4,640,648	,, ,,	8·41 ,, ,,
Total . .	55,216,903 cubic metres, or	100·00 ,, ,,	

The consumption of water per inhabitant per day in the above-named period averaged 78·5 litres (17 gallons), against 77·12 litres in the preceding year, with a daily maximum of 121·2 litres, and a minimum of 53·15 litres. The revenue from the supply of water was 7,500,171 marks; and the expenditure incurred, 5,060,213 marks—showing a balance of 2,439,958 marks. The average cost of the water was 0·09 mark per cubic metre, and the average selling price 0·135 mark.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Of the 240,000 tons of coal which the Edinburgh and Leith Gas Commissioners agreed to purchase at their meeting on April 28, it is reported that 32,000 tons are for stock at Granton, and the balance of 208,000 tons are for use during the year, of which, of course, a considerable proportion will be carbonized at Granton. In connection with the contracts, the Works Committee reported that they had before them a letter from Messrs. James M'Kelvie and Co., offering to supply all the coal required by the Commissioners during the year, but that the Committee resolved not to entertain the offer. As a matter of fact, however, Messrs. M'Kelvie secured contracts to the amount of 26,000 tons. The Commissioners agreed to purchase 3000 tons of gas oil, the same quantity as last year. It is stated that during the year which closed on May 15 the consumption of gas was 54,890,000 cubic feet more than in the previous twelve months.

In the news columns of to-day's "Dundee Courier," there is the following statement regarding the Dundee Gas-Works: "The affairs of the Dundee Gas-Works have for a considerable time back been in anything but a satisfactory condition; but the citizens will be positively astounded by the information that the accounts for the year have closed with a deficit of no less a sum than £7000. It was expected that the authorities would 'muddle through somehow;' and, indeed, in many quarters the opinion was expressed that, notwithstanding the gloomy views of several councillors, their pessimism would receive an answer in a balance on the right side being shown as a result of the year's working. At a meeting of the Gas Committee quite recently, an estimate made on the basis of a statement by the Gas Manager as to the economy in wages showed that the saving, while not so high as anticipated, would not fall far short of expectations. At the meeting, a question was put to ex-Provost Ballingall (the Convener of the Gas Committee) as to whether it would be possible to make a reduction in the price of gas this year; and he replied that he was not in a position to make a definite statement until the yearly finances were submitted. The financial year closed on May 15, and instead of the accounts even balancing themselves, the officials were nothing short of startled when they found a deficit of over £7000. So unlooked for was this result, that a meeting was summoned post haste, and the disconcerting and unpalatable information placed before them. It would appear that the production of gas per ton of coal has fallen far short of that reckoned

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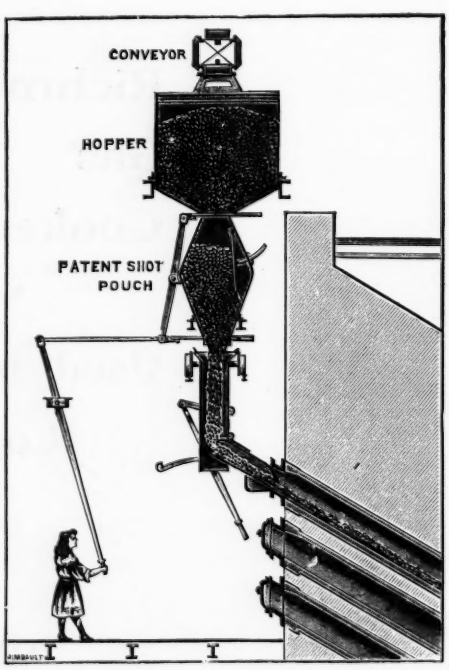

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HOT-COKE CARRIER
AT THE
BRIGHTON GAS-WORKS.

We guarantee its life.

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upon. From 61,200 tons of coal, 10,000 cubic feet of gas per ton were expected; but instead of this, the production has actually been considerably less than 9000 cubic feet per ton. The Committee resolved that a deputation should be sent to Glasgow to interview Mr. Foulis, the Manager of the Glasgow Gas-Works, to whom the plans of the reconstructed works were submitted; and Lord Provost Hunter, ex-Provost Ballingall, Bailie Stevenson, and Treasurer Ritchie were the gentlemen commissioned." Then, in a leading article upon the subject, the same newspaper says: "A climax seems at last to have been reached in connection with the eternal Dundee gas muddle. The news we give to day to the effect that a loss of over £7000 has been experienced in the financial year now closed, indicates mismanagement to an extent that cannot be tolerated by the long-suffering ratepayers. Heavy expenditure was sanctioned on the understanding that an annual saving would be effected; and the surprise occasioned by to-day's announcement will be all the greater on account of the hopes that were expressed at a recent meeting. When so much ignorance prevails as to the actual situation, it is evident there is something far wrong. In a number of articles that have appeared in our columns, the methods adopted at the gas-works were severely criticized; and it must now be apparent to everybody that the criticism was eminently just. The immediate effect of the discovery of the loss on the year's working seems to have been the departure of four councillors in hot haste to consult Mr. Foulis; but it must be obvious to everyone that no definite result can possibly be obtained from a consultation of that kind. What is urgently required is an exhaustive inquiry into the whole system of management, and a rigid application of remedies that will not fail to render the whole establishment thoroughly effective. For years the treatment of the Dundee gas consumers has been perfectly scandalous; and if the present councillors desire to retain the confidence of the electorate, they must instantaneously carry out the necessary reforms." This is very sad reading. It is to be observed that the figures have not been given; and therefore, in view of the relentless position taken up by this newspaper upon the subject, it will be better not to jump at the conclusion that what they give is the whole case. There may be a good deal to say upon the other side.

The following (a milder statement, but still showing a regrettable state of matters) appears in to-night's "Evening Telegraph," which is the evening issue of the "Dundee Advertiser": "At Monday's meeting of the Gas Committee of the Dundee Town Council, when the accounts for the year ended May 15 last are submitted, a state of affairs will be exhibited which will astonish the members, and arouse feelings of indignation throughout the community. When the year was entered upon, there was a deficiency from the previous year of about £8000; but it was estimated that the increased efficiency of the works, through their reorganization and the saving effected on the purchase of coal, would be such as to lead to that deficiency being wiped off, and to a credit balance being obtained. These expectations have, in the result, been falsified. The accounts have been made up for presentation at the meeting on Monday, and show a deficiency of £7700. The total amount of gas manufactured is 48 million cubic feet more than in the previous year—yet there is this serious state of affairs in the accounts. There are several reasons advanced for it. The chief two are the cost of labour and the shortage in the amount of gas obtained from the coal. It was estimated, in consideration of the introduction at heavy cost of so much up-to-date and labour-saving machinery, that the annual account for labour would be reduced by between £5000 or £6000; but the estimated total under this head has been exceeded by £4400. Possibly the most serious question the Committee will have to face is the amount of gas procured from the coal by carbonizing. Coal has during the past year been purchased on the most favourable terms, and the analysis made at the works showed that, on an average, at least 10,300 cubic feet of gas could be extracted from each ton of coal. The result, however, has been that the yield has been but 9300 cubic feet—a shortage of 1000 cubic feet. In addition to all this, interest and sinking fund have run off with more money than was estimated. Yesterday a deputation visited Glasgow, and had an interview with Mr. Foulis, the Manager of the gas-works there. A report will be submitted by them at Monday's meeting; and it is anticipated that there will be some plain speaking, and possibly drastic remedies suggested. Notwithstanding the large deficit, it is not expected that the price of gas will be increased; but the general feeling at the start of the financial year was that at this time there would be a substantial decrease."

It may truly be said that the valley of the Tay is at present in a state of eruption upon matters relating to gas supply. Besides the problem of the annual balance at Dundee, there is an upheaval in Perth arising out of allegations that gas consumers' bills have greatly increased during the year. But it cannot be said, whatever may be the case in the physical world, that there is any connection between the two movements, or even that the one has any effect upon the other. In Perth, the agitation was begun in the Corporation itself; and it need occasion no surprise to find that, out of nearly 9000 consumers of gas, there should be not a few whose bills should show a large increase during the year, and who should favour any movement which would lead to a reduction in the amount to be paid. As I have already stated, the Town Council resolved to call in Mr. T. Newbigging, of Manchester, to examine into the causes of the increased consumption, and to report to them. Mr. Newbigging having asked to be furnished with certain information, the Council instructed the Gas Manager and the Gas Treasurer to supply him with it. This resolution was displeasing to the party who had raised the subject. They wanted a committee to be appointed to give Mr. Newbigging the information. The Council, however, on Monday, rejected this proposal, and adhered to their original resolution.

Next day Mr. Newbigging arrived in Perth to take up his strange duty. He had a meeting with the Town Council, at which he said he thought he would not have much difficulty in arriving at a conclusion as to the causes of the alleged increase of bills. In the first place, he had put a number of queries; and these had been replied to by the Town Clerk, with the assistance of the Gas Manager and Gas Treasurer. These answers would assist him so far. He then

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Simple in mechanism.

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proposed to drive round the city, so that he might ascertain the size of pipes and get information as to the districting arrangements. He would visit the gas works and make a careful inspection of them; and he should like to be accompanied by the Gas Manager and the Gas Treasurer, and two other gentlemen whom the Council might nominate. He had drafted a circular to be sent to the more serious complainers, who would have an opportunity of calling upon him at the Council Chambers. In this way he would know the consumers' point of view. He would also, of course, gather all the information he possibly could, to enable him to accomplish the object he had in view; and the Council might rest assured that he entered upon the inquiry with an absolutely unprejudiced mind. It is reported that questions were then put to Mr. Newbigging by various members of the Council, chiefly dealing with the pressure of the gas and the quality of the coal used at the works; reference was made to the various classes of stoves used by the consumers, and as to the effect upon the consumption of the different varieties of make; his attention was drawn to the burners, which had been supplied free of charge, and which were supposed to have the effect of economizing the consumption of gas; and it was suggested that Mr. Newbigging should inquire into the possibility of air getting into the pipes and affecting the pressure. It is not stated what were Mr. Newbigging's remarks upon these various juvenile suggestions; but I give them because they throw some light upon the causes which have led to his appointment. Yesterday Mr. Newbigging sat to hear the evidence of the complaining consumers, taking them one by one. There was quite a number of them. His report is not, of course, yet out. When it comes, will it be accepted as a final disposal of the subject? This depends a good deal, I should say, upon his being able to please both parties; and there will be difficulty in doing that.

A workman in the Broughty Ferry Gas-Works on Tuesday night, in changing the gasholders, turned the wrong valve, with the result that he cut off the supply of gas to the town, part of which was thrown into darkness. In five or six minutes the mistake was rectified. The incident happened a little after 10 o'clock. Provost Gray and several members of the Town Council hurried to the gas works, and gave instructions that, in order to obviate danger in the cases where people retired to bed leaving the gas alight, the gas should be turned off at 11.30 p.m. and be turned on again the following day at 10 a.m.

Some fifteen or twenty years ago, the consumption of gas at Renfrew was at a very low ebb; and the Corporation Gas Commissioners were in so despondent a condition over their gas affairs that they first invited the Gas Committee at Paisley to take over the supply on practically their own terms, and afterwards, when Paisley declined, offered it to Glasgow, with a like result. But it was evident that Renfrew was destined to turn over a new leaf in respect of its gas supply. In the hands of Mr. Lighbody, who has for some time been the active and energetic Engineer and Manager, the gas consumption has within the past six years or so rising from 10 to something like 31 millions. The consumers have largely adopted penny-in-the-slot meters; it is said there are only 10 per cent. of the householders who use oil or some illuminant other than gas. The little town is now progressing by leaps and bounds—dwelling-houses being put up in great numbers, in terraces, to the extent even of supplying accommodation, within a comparatively short period, for more than 5000 people; and more houses are being erected. There are two large shipbuilding yards and other works within the burgh; and though they are large consumers of electricity, they give employment to a number of workpeople, who make use of gas.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *May* 31.

Sulphate of Ammonia.

The market has assumed a quieter tone, the requirements of the month being about covered; but there are no stocks to carry over, and the closing quotations f.o.b. Liverpool and Leith remain £12 17s. 6d. to £12 18s. 9d. per ton. Hull is quoted £12 15s. per ton; but buyers do not respond, demand for the Continent having dropped off. £12 15s. per ton f.o.b. Leith is readily paid for all June delivery. London, Beckton terms, July-September delivery, is quoted £12 12s. 6d. per ton, and October-March £11 17s. 6d. per ton. The latter position f.o.b. Leith, ordinary terms, is quoted £12 per ton, but buyers do not seem inclined to follow the advance up to this point, and there are speculative sellers at less money.

Nitrate of Soda.

This is weak in all positions, and the spot quotations are 9s. and 9s. 1½d. per cwt. for ordinary and refined qualities respectively. The uncertainty as to the shipments to be made, April, 1902—March, 1903, hinders business in the forward position, buyers being unwilling to operate even at the lower levels.

LONDON, *May* 31.

Tar Products.

The markets are generally quiet, with an absence of demand, excepting for pitch, which still continues very firm, with a decided tendency to increased values for both prompt and forward delivery. Very high prices have been paid in London for prompt by local consumers; but the demand for export is nearly over for the present season. Benzol is very dull. Business is reported in 90 per cent. at 8¾d., July-December, at an outport; but 50-90 per cent. is quite neglected. As regards solvent and toluol, the position is unaltered, and prices are purely nominal. In anthracene some small sales of "A" quality are reported for prompt delivery, but at very low prices. Creosote is dull, especially in the North, where small sales are reported at 1d. per gallon for early delivery. Crude carbolic acid continues in fairly good demand at 1s. 11d. per gallon, June-July delivery; but consumers do not care about purchasing up to the end of the year, doubtless owing to the great stagnation that exists in crystals.

Average values during the week: Tar, 16s. 6d. to 21s. Pitch, London, 44s. to 44s. 6d.; east coast, 42s. 6d. to 43s.; west coast, 38s. to

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FOR ENRICHING GAS IN BULK.
PREVENTS NAPHTHALENE DEPOSITS.
OVER 100 MAXIM PATENT CARBURETTORS HAVE NOW BEEN FIXED.
Among the Companies and Towns supplied are The Gas Light and Coke Company, The South Metropolitan Gas Company, Birmingham, Leeds, Rochdale, Bristol, Sheffield, Southport, Alloa, Broughty Ferry, Dunfermline, and many other Works, both large and small, where they have been working in some instances for the past Seven Years.
MORE GAS & SALEABLE COKE PER TON of COAL CARBONIZED is PRODUCED; SAVING CAPITAL, LABOUR, FUEL, WEAR & TEAR, &c.
THE ENRICHMENT IS INSTANTANEOUS AND PERMANENT.
The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel.
Dealers in Benzol, Carburine, and all other Naphthas and Oils suitable for the Enrichment or Production of Gas.
For Prices and full Particulars, apply to
THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,
18. DEVONSHIRE STREET, BISHOPSGATE, LONDON, E.C.

38s. 6d. Benzol, 90 per cent., 8d. to 8½d. ; 50-90 per cent., 7d. to 7½d. Toluol, 9d. Crude naphtha, 2¾d. to 3d.; solvent naphtha, 9d. to 9½d.; heavy naphtha, 9d. to 10d. Creosote, London, 1¼d. ; North, 1d. Heavy oils, 1⅛d. Carbolic acid, 60 per cent., 1s. 11d. Naphthalene, 35s. to 50s. ; salts, 21s. 6d.to 25s. Anthracene, "A," 1½d. to 1¾d. ; "B," 1d. nominal.

Sulphate of Ammonia.

The market is very firm; and the demand continues strong, especially for prompt shipment. The Gaslight and Coke Company have sold at £13 for early June, and now ask this price for June-July, although they will have very little indeed to spare before the end of September. For October-March their price still remains £11 17s. 6d. In Leith, a large business has been done at £12 15s., and in one instance £12 16s. 3d. is reported to have been paid. Makers now ask £12 17s. 6d., which is a little over buyers' ideas of value. A considerable quantity has been placed for October-March; and there are still inquiries over this period. In Liverpool fancy prices have been paid for prompt shipment. One sale is reported at £13 1s. 3d., while £13 was realized for several parcels. In Hull, the demand has not been so considerable. £12 15s. was paid for prompt shipment in one or two special instances; but, as a rule, prices range from £12 12s. 6d. to £12 13s. 9d. The market closes very firm, with a good inquiry for present and forward delivery.

COAL TRADE REPORTS.

Lancashire Coal Trade.

Operations in the coal trade are now proceeding in something like their ordinary course after the interference caused by the holidays. As to the actual business position, the only change to notice is the reduced call for house coal, owing to the more summer-like weather; and this has not as yet gone far enough to very materially affect the position of colliery owners. The recent demand has been considerably above the average for the time of the year; and the very moderate stocks that were held have in some cases been practically cleared away to meet requirements during the holiday stoppages of the pits. Prices, consequently, have been fairly steady at the reduced rates which came into operation at the beginning of May. A moderate demand is reported for the lower qualities of round coal suitable for iron making, steam, and general manufacturing purposes, with prices at the pit maintained on the recent basis of about 8s. 6d. per ton for ordinary and 9s. for better sorts. With regard to gas coals, the more important contracts as a rule have not yet come forward. On business of any moment so far put through, however, the basis of prices has been much as indicated in previous reports. As to locomotive fuel, also, there is nothing new to notice. Inquiry continues fairly active for the better qualities of engine fuel, with prices at the pit well maintained at about 6s. 6d. to 7s. The commoner sorts, however, are somewhat irregular in price; local collieries reporting that they have difficulty in holding to their quoted rates, owing to the competition from other districts at low-cut figures. Lancashire common slack remains about 4s. 6d. to 5s., with 5s. 6d. to 6s. quoted for good medium descriptions; but slack from Derbyshire is offered at the pit at all sorts of prices, ranging from 2s. 6d. to 3s. 6d. per ton. The shipping trade is moderate, with rather more doing here and there; but prices generally remain without improvement, averaging 9s. 6d. to 10s. and 10s. 3d. for steam coal, according to quality, delivered at the Mersey ports. Best Lancashire foundry coke is steady at about 22s. to 24s., and best furnace cokes at 13s. 6d. to 14s., at the ovens.

Northern Coal Trade.

There has been a steadier demand for coal, and with steamers plentiful the shipments have been heavy of late, some stocks having been reduced in the holiday period. Best Northumbrian steam coals are from 11s. to 11s. 6d. per ton f.o.b., and are in steady demand. Second-class coals are dull at 10s. to 10s. 3d. per ton, being in plentiful supply; while steam smalls are firm at from 5s. 6d. to 6s. In the Durham coal trade, the demand is not quite so brisk; this being the dull season of the year for several kinds of the produce of that county. In the gas coal trade, the demand is fair; exports partly making up the loss of the home demand. In regard to the prices, there is a difference of some moment—the best classes of Durham coals being quoted at from 9s. to 9s. 3d. per ton f.o.b., while for other kinds the price is from 8s. 6d. to 9s. Two local contracts are believed to be settled at prices that are equal to the average of these. The coke trade is on the whole steady. Best Durham coke for export is 17s. per ton f.o.b., furnace coke is 15s. 3d. at the Teesside furnaces, and gas coke is rather irregular—the output being low, and the shipments rather fuller, so that the price is a little steadier at the figures last quoted.

Scotch Coal Trade.

The market remained unchanged, as was to be expected until the question of the continuation of the Conciliation Board should be determined. Now that this has been resolved upon, trade should move more freely. Notwithstanding the dubiety of the past few weeks, the demand has kept well up, due to the opening up of the Baltic trade; but, so far, it has not been of exceptional volume, or higher figures would have been reached. The quotations were: Main 8s. 3d. to 8s. 6d. per ton f.o.b. Glasgow, ell 9s. 3d. to 10s. 3d., and splint 9s. 3d. to 9s. 6d. The shipments for the week amounted to 227,475 tons—a decrease of 5801 tons upon the previous week, but an increase of 3017 tons upon the corresponding week of last year. For the year to date, the shipments have been 3,857,791 tons—an increase of 348,934 tons upon the same period of the previous year.

We learn from Mr. W. Edgar, of Hammersmith, that it has been decided to light the whole of the incandescent lanterns in the Stoke Newington district by means of the Foulger-Glover torch, which has also been adopted by the Hornsey Urban District Council.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

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The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cubic Feet Daily.
BLACKBURN	1,250,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000
SALTLEY WORKS, BIRMINGHAM	2,000,000
COLCHESTER	300,000
BIRKENHEAD.	2,250,000
SWINDON (New Swindon Gas Co.)	120,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000
HALIFAX	1,000,000
TORONTO	250,000
OTTAWA.	250,000
LINDSAY (Remodelled)	125,000
MONTREAL	500,000
TORONTO (Second Contract; Remodelled)	2,000,000
BELLEVILLE	250,000
OTTAWA (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000
ST. CATHERINES (Remodelled)	250,000
KINGSTON, PA.	125,000
PETERBOROUGH, ONT.	250,000
WILKESBARRE, PA.	750,000
ST. CATHERINES (Second Contract)	250,000
BUFFALO, N.Y.	2,000,000
WINNIPEG, MAN.	500,000
COLCHESTER (Second Contract)	300,000

	Cubic Feet Daily.
YORK	750,000
ROCHESTER	500,000
KINGSTON, ONT.	300,000
CRYSTAL PALACE DISTRICT	2,000,000
DULUTH, MINN.	300,000
CATERHAM	150,000
LEICESTER	2,000,000
ENSCHEDE (HOLLAND)	150,000
BUENOS AYRES (RIVER PLATE CO.)	700,000
BURNLEY	1,500,000
KINGSTON-ON-THAMES	1,750,000
ACCRINGTON	500,000
TONBRIDGE	300,000
STRETFORD	500,000
OLDBURY	300,000
TODMORDEN	500,000
SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
YORK (Second Contract)	750,000
ROCHESTER (Second Contract)	500,000
NEWPORT (MON.)	250,000
TOKIO, JAPAN.	1,000,000
PERNAMBUCO (Brazil)	125,000
MALTON	150,000
DULUTH, MINN. (Second Contract)	300,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

LEEDS, 1,800,000 Cub. Ft. SMETHWICK, 500,000 Cub. Ft. LEICESTER (2nd Cont.) 1,000,000 Cub. Ft
GRAVESEND, 300,000 C. Ft. BROCKVILLE (ONT.) 250,000 C. Ft. NEWPORT, MON. (2nd Cont.), 250,000 C. Ft.

Messrs. R. & G. Hislop, of Paisley, have recently received orders for retort-settings on their shallow regenerative system for Brechin and Hong Kong.

The Longwood Gas Company have placed with Messrs. R. Dempster and Sons, Limited, of Elland, the order for a 96 ft. 6 in. diameter two-lift gasholder, prepared for three lifts, each 20 feet deep.

At the Mart, this afternoon, Mr. Alfred Richards will offer for sale, by order of the Directors, £10,000 of additional "B" consolidated stock of the Tottenham and Edmonton Gas Company, being a portion of the additional capital authorized by their Act of 1898; and also new issues by the Bournemouth, Maidenhead, and Walton Companies.

A noteworthy feature of the King's birthday celebrations was the illumination of the Opera House, Covent Garden. A Royal Crown, supported on either side by a huge "E. R." in gas, and flanked by a Garter Star at each end of the portico, had a brilliant effect. The whole was carried out by Messrs. Ritchie and Co., of 46, Hatfield Street, Southwark.

As an instance of the discrimination at times exercised by the Post Office, and the universal knowledge possessed with regard to the Welsbach light, it is interesting to record that the Welsbach Incandescent Gas Light Company, Limited, last week, received a registered letter, intended for them, from Beyrouth (Syria) simply addressed "Messrs. Burner Mantle and Chimney, London."

The report of the Bulawayo Water-Works Company for the year ended Dec. 31 shows that the receipts from the sale of water and electric light for that period amounted to £2171 and £13,065 respectively—an increase of £2084 on the receipts for the previous year. The net profit of £3489 it is proposed to carry forward; making the total balance to the credit of the profit and loss account £10,775.

The bonus and shares earned under the profit-sharing scheme were presented to the Dublin employees of the Richmond Gas Stove and Meter Company by the Managing Director (Mr. E. W. T. Richmond) on the 29th ult. No less than 44 employees were eligible by length of service and merit to participate. Afterwards, Mr. Richmond presented a very handsome clock to the Foreman, Mr. J. E. Morfett. The clock had been subscribed for by the workmen and staff as a mark of their esteem and good wishes on the occasion of his marriage.

In the Cambridge Hall, Southport, on the 30th ult., an exhibition of Messrs. R. & A. Main's gas cookers and fires was opened, and demonstrations in cookery were given by Miss M. Baines, of the Manchester School of Cookery. The exhibition will remain open until the 13th inst.

According to the "Financial News," the insurance on the Welsbach Company's works in Westminster, which were burnt on the 20th ult., amounted to £132,000. The loss is estimated at 25 per cent. of this amount. The £132,000 is distributed as follows: Royal, £40,000; Yorkshire, £14,000; Commercial Union, £15,000; Fine Art and General, £10,000; Atlas, £9000; Phœnix, £8000; Imperial, £8000; Sun, £8000; Union, £7000; Scottish Alliance, £5000; Scottish Union and National, £3000; National of Ireland, £3000; Lion, £2000.

At the meeting of Meters, Limited, last Tuesday, the Chairman (Alderman Miles, of Bolton), in moving the adoption of the report, noticed in the "Journal" for the 20th ult., congratulated the proprietors on the fact that the Company's turnover was increasing year by year. Their profit had somewhat increased, mainly through better working and organization, and improvements in many ways at their various works. There was a balance of £2111, after providing for the half-year's dividends. All they could hope for was a continuance of the prosperous business they had had during the last five years. Mr. W. Jackson, in seconding the motion, said he was inclined to take an optimistic view of their position. The report was adopted.

The Natural Gasfields of England, Limited, is the title of a Company recently registered with a capital of £100,000, in £1 shares, to adopt an agreement with the Natural Gas and Power Company, Limited, to search for and make borings, experiments, and other works for ascertaining the existence, location, quantity, and workable nature of natural gas, mineral oil, and other minerals and mineral substances and products believed to exist under any land in England; to acquire any mines and mining rights; to prepare for market any mineral substances; and to carry on the business of producers and suppliers of gas, oil, and electricity for any purpose, manufacturers of, and dealers in, gas-mantles, gas-burners, stoves, engines, and other apparatus, conveniences, fittings, and appliances used in connection with lighting and heating; and as general engineers, chemical manufacturers, manufacturers of drugs, acids, and alkalies, importers of rare earths, &c. There will be no initial public issue.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571 Central.

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Resists 4500° Fahr. Best for GAS-WORKS.
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Calcium Oxide (Quick Lime) . .	98·9
Magnesia and Alumina	0·5
Silica	0·6
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HIGH CLASS CYCLES at lowest Prices guaranteed and sent on APPROVAL for Cash or GRADUAL PAYMENTS. Catalogue and Testimonials from Gas Managers post free.
MELROSE CYCLE COMPANY, COVENTRY.

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J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.
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JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

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BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

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SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.
For REPAIRS or ALTERATIONS, ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."
Largest Practice and most Up-to-Date Works in Britain.
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Correspondence on this subject is invited by the ACETYLENE ILLUMINATING COMPANY, LIMITED, 3, Victoria Street, LONDON, S.W.

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H. GREENE & SONS, Ltd., are prepared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.
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MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

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MARK DUFFIELD & SONS, Engineers and Contractors to the Principal Home and Foreign Gas and Electric Companies, invite inquiries.
London Manager, EDWARD PADFIELD, 27, Leadenhall Street, E.C. Telegrams: "Eupathy, London."

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WANTED, a Man used to Works Fitting, and able to do Smith's Work on Small Works near London.
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Applications, stating Age, Experience, and *copies* of recent Testimonials, to be sent in as early as possible to Mr. J. W. HELPS, Engineer and General Manager, Gas-Works, CROYDON.
May 29, 1902.

GAS MANAGERSHIP.

THE New Mills Urban District Council require a MANAGER for their Gas-Works.
Applications in candidate's own handwriting, stating present and previous employment, Age, Salary required, and whether in a position to commence duties at once, accompanied by not more than three recent testimonials, to be sent to me, the undersigned, properly endorsed, not later than Five o'clock Monday, June 9, 1902
J. POLLITT,
Clerk to the Council.
Town Hall, New Mills,
May 29, 1902.

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FOR SALE—Two Steam-Boilers, 18 feet long by 6 feet diameter, each with two flues. Made by Galloway. In good condition, with mountings complete.
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Apply, by letter, to No. 3865, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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FOR SALE—Cheap, A Cast Iron SCRUBBER, 4 ft. 6 in. diameter by 40 ft. high. Ironwork and Boards in good condition. Taken out to be replaced by Scrubber-Washer.
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FOR SALE—Gasholder, 20 ft. diameter, 10 ft. Lift. Complete with Standards, &c. Suitable for Brick Tank. Can be seen in sections near London. A Bargain.
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10-inch SCRUBBER-WASHER, by Clapham, overhauled and perfect.
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A TWO-LIFT Gasholder in good con- dition. Working capacity 25,500 cubic feet. Diameter of Outer Lift, 35 ft. by 14 ft. deep. Six Cast-Iron Columns.
Price to include taking down and removal.
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GASHOLDERS, 15 ft. to 50 ft. diameter.
Iron or Steel TANKS for ditto.
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GASHOLDER, 14 ft. by 10 ft. with 3 Columns and Suspension.
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GASHOLDER, 30 ft. by 12 ft. with 4 Columns.
GASHOLDER, 43 ft. by 14 ft. with 5 Columns and Suspension.
GASHOLDER, 45 ft. by 14 ft. with 5 Columns and Two Lift.
GASHOLDER, 80 ft. by 20 ft. with 10 Columns Two Lift.
Write J. WRIGHT, 181, Queen Victoria Street, E.C.

COUNTY BOROUGH OF OLDHAM.

THE Oldham Corporation Gas-Works Committee are prepared to receive TENDERS for the supply of about 113,000 Tons of COAL and CANNEL required by them during the Year ending the 30th of June, 1903.
Specifications and Forms of Tender can be obtained on application to Mr. Arthur Andrew, Gas and Water Offices, Oldham, to whom Tenders are to be sent on or before Tuesday, the 17th of June.
A. NICHOLSON,
Town Clerk.
Oldham, May 22, 1902.

COUNTY BOROUGH OF OLDHAM.

THE Gas-Works Committee invite TENDERS for the TAR and AMMONIACAL LIQUOR to be produced at their different Gas Stations for a period of One or more Years, commencing the 1st of July next.
The Yearly make of Tar is about 8000 Tons, and of Ammoniacal Liquor about 2,500,000 Gallons.
Particulars and Forms of Tender can be obtained on application to Mr. Arthur Andrew, Gas and Water Offices, Oldham, to whom Tenders are to be sent on or before Tuesday, June 17, 1902.
A. NICHOLSON,
Town Clerk.
Oldham, May 22, 1902.

CORPORATION OF LANCASTER.
(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Gas Committee are prepared to receive TENDERS for the supply of screened GAS COAL, to be delivered on the Gas-Works Siding, Lancaster, in such quantities and at such times as may be required during periods of Nine Months and Twelve Months; commencing delivery July 1 next
Sealed Tenders, endorsed "Gas Coal," giving full Particulars of the Coal offered, must be delivered to T. C. Hughes, Esq., Town Clerk, Lancaster, before Twelve o'clock noon on Monday, June 9.
Any further Information and Forms of Tender may be obtained on application to the undersigned.
C. ARMITAGE,
Manager.
Gas-Works, Lancaster,
May 29, 1902.

URBAN DISTRICT COUNCIL OF STOURBRIDGE.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply and delivery of 15,000 Tons of GAS COAL.
Forms of Tender, &c., may be had on application to the undersigned. Only offers on our own Form will be considered.
Tenders, endorsed "Gas Coal," and addressed to the Chairman of the Gas Committee, to be sent to me at the Gas-Works, Stourbridge, on or before Tuesday, the 17th day of June, 1902.
The lowest or any Tender not necessarily accepted.
By order,
WM. NORTH,
Engineer and Manager.
Stourbridge Gas-Works,
May 24, 1902.

SUTTON, SOUTHCOATES, AND DRYPOOL GAS COMPANY, HULL.

SULPHURIC ACID.

THE Directors are prepared to receive TENDERS for the supply of SULPHURIC ACID, suitable for the manufacture of Sulphate of Ammonia, for a period of One Year from the 1st of July, 1902, delivered in Hull in the senders' carboys.
Tenders, addressed to the undersigned, to be delivered, endorsed "Tender for Sulphuric Acid," not later than noon on Wednesday, June 18.
The Directors do not bind themselves to accept the lowest or any Tender.
Further Particulars may be obtained on application.
By order,
DAVID WOOD,
Secretary.
Gas Offices: St Mark's Street, Hull.
May 30, 1902.

THE Directors of the Sutton, South- coates, and Drypool Gas Company, Hull, invite TENDERS for the Purchase of the surplus TAR produced at their Works during the Twelve Months ending the 30th of June, 1903. Probable quantity, 1100 Tons.
Tenders, addressed to the undersigned, to be delivered, marked "Tender for Tar," before noon on Wednesday, the 18th of June, 1902.
The highest or any Tender not necessarily accepted.
By order,
DAVID WOOD,
Secretary.
Gas Offices: St. Mark's Street, Hull,
May 30, 1902.

THE Directors of the Sutton South- coates and Drypool Gas Company, Hull, invite TENDERS for the supply of 16,000 Tons of Best Silkstone GAS COAL, stating price per ton for each of the following descriptions—Screened, Unscreened, and Cobbles—for delivery during the Year ending the 31st of May, 1903, in North-Eastern Railway Company's Waggons into this Company's Siding, Dansom Lane, Hull.
The lowest or any Tender will not necessarily be accepted.
Tenders to be sent, addressed to the undersigned, before Twelve o'clock noon, on Wednesday, the 18th of June, 1902, marked "Tender for Coal."
By order,
DAVID WOOD,
Secretary.
Offices: St. Mark's Street, Hull,
May 30, 1902.

URBAN DISTRICT COUNCIL OF LYMM.

THE above Council are prepared to re- ceive TENDERS for the supply of CANNEL and best screened GAS COAL, to be delivered at their Gas-Works in Lymm, for a term of Twelve Months from the 1st day of July, 1902.
The probable quantities required will be about 120 Tons of Cannel and about 1700 Tons of Gas Coal, which must be freshly wrought, well screened, and free from Sulphurous Pyrites, and other objectionable matter; but the Council reserve the right of increasing or decreasing the quantities named.
The person whose Tender is accepted will be required to enter into an agreement with the Council for the due performance of his Contract.
Sealed Tenders, stating price per ton delivered alongside the Works, to be sent to the undersigned on or before the 18th day of June, 1902, and endorsed "Coal Tender."
The Council do not bind themselves to accept the lowest or any Tender.
Forms of Tender are not supplied.
Further Particulars may be had on application to the Gas Manager, Mr. W. L. Donaldson.
W. MULLARD,
Clerk.
Council Offices, Lymm,
Cheshire, June 2, 1902.

TAR AND AMMONIACAL LIQUOR.

THE Lymm Urban District Council are prepared to receive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR made at their Gas-Works, for a term of One Year from the 1st day of July, 1902 (or for such longer term as may be contracted for with the consent of the Council).
Tar and Liquor will be delivered free into Contractor's boat on the Bridgwater Canal.
Tenders to be sent to the undersigned on or before the 18th day of June, 1902, endorsed "Tar."
The purchaser will be required to enter into an agreement with the Council for the due performance of his Contract.
The Council do not bind themselves to accept the highest or any Tender.
Forms of Tender are not supplied.
Further Particulars may be had on application to the Gas Manager, Mr. W. L. Donaldson.
W. MULLARD
Clerk.
Council Offices, Lymm, Cheshire.
June 2, 1902.

READING GAS COMPANY.

TAR.

THE Directors of the Reading Gas Company invite TENDERS for the purchase of their surplus TAR for One Year, commencing on the 1st of July next.

Specifications for the Contract will be forwarded on application. Railway Communication direct to the Works.

Tenders, endorsed "Tender for Tar," must be delivered not later than Monday, the 16th of June, to

ARTHUR H. CANE,
Secretary.

7, King Street, Reading,
May 30, 1902.

FENTON URBAN DISTRICT COUNCIL.

TENDERS FOR GAS COAL.

THE Gas Committee of the above Council invite TENDERS for the supply and delivery of 8000 Tons of GAS COAL, BURGY, NUTS, or BEANS for the Twelve Months commencing the 1st of July next.

Specification and Form of Tender may be obtained on application to the undersigned.

Sealed Tenders, endorsed "Coal," to be forwarded to the Chairman, Gas-Works, Fenton, Staffs., not later than Saturday, the 14th of June, 1902.

The lowest or any Tender not necessarily accepted.

ROBERT SURTEES,
Engineer and Manager.

Gas-Works, Fenton, Staffs.,
May 30, 1902.

FENTON URBAN DISTRICT COUNCIL.

TAR AND AMMONIACAL LIQUOR.

THE Gas Committee of the above Council invite TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR made at their Works during the Twelve Months commencing the 1st day of July next.

Sealed Tenders, to be sent in not later than Saturday, June 14, 1902, addressed Chairman, Gas-Works, Fenton, Staffordshire, and endorsed "Tender for Tar, &c."

The Committee reserve to themselves the right of accepting any Tender for the Tar or Liquor separately.

The Committee do not bind themselves to accept the highest or any Tender.

Further Particulars may be obtained on application to the undersigned.

ROBERT SURTEES,
Engineer and Manager.

Gas-Works, Fenton, Staffs.,
May 30, 1902.

LINCOLN CORPORATION.

(GAS DEPARTMENT.)

TENDERS FOR COAL.

THE Gas Committee of the Lincoln Corporation invite TENDERS for the supply of 26,000 Tons of screened GAS COALS and NUTS, to be delivered during a period commencing the 1st of July, 1902, and terminating the 30th of June, 1903.

Further Particulars and Forms of Tender may be obtained from the undersigned.

Sealed and endorsed Tenders, addressed to the Chairman of the Gas Committee, must be delivered on or before the 14th of June next.

The Committee do not bind themselves to accept the lowest or any Tender.

JNO. CARTER,
Manager.

Gas Offices, Lincoln,
May 24, 1902.

LINCOLN CORPORATION.

(GAS DEPARTMENT.)

TENDERS FOR TAR.

THE Gas Committee of the Corporation of Lincoln are prepared to receive TENDERS for the purchase of the surplus TAR (about 1000 Tons) produced at their Works during the period of One Year commencing on the 1st of July, 1902.

Sealed Tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Residuals," must be delivered at the Gas Offices, Lincoln, on or before the 14th of June next.

The Committee do not bind themselves to accept the highest or any Tender.

Other Particulars may be obtained of the undersigned.

JNO. CARTER.
Manager.

Gas Offices, Lincoln,
May 24, 1902.

RHONDDA URBAN DISTRICT COUNCIL.

(GAS AND WATER DEPARTMENT.)

TENDERS FOR COALS AND PIPES.

THIS Council are prepared to receive TENDERS for the following:—

1.—The supply from the 1st of July, 1902, to the 30th of June, 1903, of 16,000 Tons of GAS COALS, delivered at Porth and Ystrad Gas-Works.

2.—CAST-IRON PIPES, required from the 1st of July, 1902, to the 30th of June, 1903.

Specifications and Forms of Tender can be obtained on application to the Engineer and Manager, Mr. Octavius Thomas, Gas and Water Offices, Pentre, R S.O., Glam.

Tenders, to be addressed to the Chairman of the Gas and Water Committee, endorsed "Tender for Coals" or "Tender for Pipes" as the case may be, and delivered at my Office not later than Ten a.m. on Thursday, June 19, 1902.

The Contractors will be required to pay the standard rate of wages recognized in the district.

The Council do not bind themselves to accept the lowest or any Tender.

WALTER P. NICHOLAS,
Clerk.

Council Offices,
Pentre, R.S.O., Glam., May 26, 1902.

THE Urban District Council of Atherton invite TENDERS for the purchase of the surplus TAR produced at their Gas-Works during One Year from June 30, 1902.

Sealed Tenders (on the Official Form) to be delivered to me on or before Wednesday, June 11.

DANIEL SCHOFIELD,
Clerk.

Town Hall, Atherton,
Lancs., May 29, 1902.

THE Urban District Council of Atherton invite TENDERS for the supply of 7000 Tons of screened GAS COAL or NUTS, from the 1st of July, 1902, to the 30th of June, 1903.

Forms of Tender and further Information may be had from the undersigned, to whom Tenders should be delivered on or before Wednesday, June 11.

DANIEL SCHOFIELD,
Clerk.

Town Hall, Atherton,
Lancs., May 29, 1902.

BUXTON URBAN DISTRICT COUNCIL.

TENDERS FOR CANNEL.

THE Gas Committee invite Tenders for the supply of 3000 Tons of CANNEL, to be delivered at their Siding, on the Midland Railway, in Ashwood Dale, Buxton, during the Year ending the 30th of June, 1903.

Forms of Tender and other Particulars may be obtained of Mr. H. Barker, Engineer, Town Hall, Buxton.

Sealed Tenders, endorsed "Tenders for Cannel," to be addressed to the Chairman of the Gas Committee, and delivered not later than Saturday, June 14.

The Committee do not bind themselves to accept the lowest or any Tender.

By order,
JOSIAH TAYLOR,
Clerk.

BUXTON URBAN DISTRICT COUNCIL.

TENDERS FOR TAR AND LIQUOR.

THE Gas Committee invite Tenders for the purchase of the surplus TAR and LIQUOR produced at their Works in Ashwood Dale, Buxton, for One Year commencing from the 30th of June next.

Forms of Tender and other Particulars may be obtained of Mr. H. Barker, Engineer, Town Hall, Buxton.

Sealed Tenders, endorsed "Tenders for Tar and Liquor," to be addressed to the Chairman of the Gas Committee, and delivered not later than Saturday, June 14, 1902.

The Committee do not bind themselves to accept the highest or any Tender.

By order,
JOSIAH TAYLOR,
Clerk.

BOROUGH OF TODMORDEN.

(GAS DEPARTMENT.)

COAL AND CANNEL.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the supply of 10,000 Tons of GAS COAL and 1000 Tons of CANNEL.

Full Particulars and Form of Tender can be obtained from the Engineer and Manager, Mr. Hy. Hawkins, Gas-Works, Todmorden.

Tenders to be delivered at the Town Clerk's Office, Town Hall, Todmorden, addressed to the Chairman of the Gas Committee, before Five p.m. on June 10, endorsed "Coal" or "Cannel" as the case may be.

The Committee do not bind themselves to accept the lowest or any Tender.

HY. HAWKINS,
Engineer.

BOROUGH OF TODMORDEN.

(GAS DEPARTMENT.)

GENERAL STORES.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the supply of GENERAL STORES required for the ensuing Twelve Months.

Full Particulars and Form of Tender can be obtained from the Engineer, Mr. Hy. Hawkins, Gas-Works, Todmorden.

Tenders to be delivered at the Town Clerk's Office, Town Hall, Todmorden, addressed to the Chairman of the Gas Committee, and endorsed "General Stores," not later than Five p.m. on June 10.

The Committee do not bind themselves to accept the lowest or any Tender.

HY. HAWKINS,
Engineer.

CITY OF BRADFORD.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Bradford Corporation are prepared to receive TENDERS for the supply of best GAS COAL, COBBLES, NUTS, and CANNEL, all to be well-screened, dressed, and free from shale and pyrites, to be delivered at the several Works of the Corporation in the City during the period of One Year or of Two Years, commencing on the 1st day of July next, as may be agreed upon.

Form of Tender, with any further information required, may be had on application to Mr. Wood, Gas Engineer, Town Hall.

Sealed Tenders, endorsed "Tender for Coal," to be sent to me on or before Thursday, the 12th of June next.

Persons tendering must give an assurance that they have paid to their Workmen for the three months preceding the date of Tender not less than the minimum Standard Rate of Wages, and undertake to continue to pay during the contract the said rate of Wages.

The lowest or any Tender will not necessarily be accepted.

FREDERICK STEVENS,
Town Clerk.

Town Hall, Bradford,
May 30, 1902.

MALTON GAS COMPANY.

TENDERS FOR GAS COAL.

THE Directors invite Tenders for the Supply of about 4000 Tons of GAS COBBLES or NUTS in the Twelve Months ending June 30, 1902.

Further Particulars may be obtained of the undersigned. Tenders to be sent in on or before June 7.

HENRY TOBEY,
Secretary.

SEVENOAKS GAS COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the Sevenoaks Gas Company, invite TENDERS for the supply of 8000 Tons of GAS COAL (Durham or Yorkshire preferred), at the Company s Siding, Bat and Ball Station S.E. & C. Railway, Sevenoaks, Kent, for Twelve Months, ending June 30, 1903.

Tenders must be sent in by not later than Tuesday, June 10, 1902, addressed to the Chairman, W. Henry Carall, Esq., 88, High Street, Sevenoaks.

Further Particulars may be obtained of the undersigned,

HENRY HOW,
Secretary.

Gas Offices, Sevenoaks,
May 31, 1902.

GLASGOW CORPORATION.

(GAS DEPARTMENT.)

TO IRONFOUNDERS.

THE Corporation of Glasgow are prepared to receive TENDERS for the following quantities of Cast-Iron GAS-MAINS, viz., 1300 yards of 18-in. diameter Pipes and 2740 yards of 12-in. diameter Pipes, with such SPECIAL CASTINGS as may be required.

Specification and Form of Tender may be obtained on application to Mr. W. Foulis, Gas Engineer, at his Office, No. 45, John Street, Glasgow.

Sealed offers, marked "Gas Department—Tenders for Cast-Iron Pipes," addressed to the subscriber, will be received by him on or before Tuesday, the 10th of June next.

The Corporation do not bind themselves to accept the lowest or any Tender.

J. D. MARWICK,
Town Clerk.

City Chambers, Glasgow,
May 30, 1902.

URBAN DISTRICT COUNCIL OF HINDLEY.

THE Urban District Council of Hindley require to dispose of the following at their Gas-Works, Cross Street, Hindley, and invite TENDERS for the purchase of same, viz:—

Four Second-hand PURIFIERS, 12 ft. square by 4 ft. deep, with two overhead cover-lifting crabs, cast-iron supporting columns and girders, one dry-faced 12-in. centre valve and 12 in. connections, with grids complete.

One second-hand STATION METER in square case, capacity about 10,000 cubic feet per hour, with inlet, outlet, and bye-pass valves complete.

All Information respecting same may be obtained from Mr. Wm. Dickinson, Gas Manager, Cross Street, Hindley.

Tenders, endorsed "Purifiers," to be sent to the undersigned not later than Monday, the 16th of June, 1902.

By order,
STEPHEN HOLT,
Clerk.

Offices, Cross Street,
Hindley, May 30, 1902.

TIPTON GAS-WORKS.

TAR CONTRACTS.

THE Gas Committee of the Tipton Urban District Council are prepared to receive TENDERS for the purchase of the surplus TAR made at their Gas-Works, for a period of One Year from the 1st day of July, 1902.

The Tar will be delivered free into Contractor's Boats on the Canal.

The purchaser will have to enter into an agreement with the Council for the due performance of his Contract.

Sealed Tenders, stating Price per ton for Tar, to be sent to the undersigned on or before the 14th day of June, 1902, endorsed "Tender for Tar."

The Committee do not bind themselves to accept the highest or any Tender.

Further Particulars may be had on application to Mr. S. O. Stephenson, the Engineer and Manager.

By order,
JOHN W. WARING,
Clerk to the Council.

Public Offices, Tipton,
May 31, 1902.

ALTRINCHAM GAS COMPANY.

COAL AND CANNEL CONTRACTS.

TENDERS are invited for best screened GAS COAL and CANNEL for One Year from the 1st of July, 1902. Estimated quantities required: Coal 11,000 Tons; Cannel 4000 Tons.

Deliveries to be free at Altrincham Railway Station, and as required.

Sealed Tenders, endorsed "Tender for Coal and (or) Cannel," stating the description of each, the pits from which they are to be raised, the quantity proposed to be supplied, and cash terms for monthly payments, to be sent addressed to the undersigned so as to be received not later than Twelve o'clock noon on Monday, the 9th day of June next.

The Directors do not bind themselves to accept the lowest or any Tender; but the person or persons whose tender may be accepted will be required to execute an agreement for the due performance thereof,

No special Form of Tender is required or supplied.

F. R. B. LINDSELL,
Secretary.

Gas Offices, Moss Lane,
Altrincham, May 28, 1902.